SIXTH ANNUAL MEETING

OF THE

NATIONAL

TELEPHONE EXCHANGE

ASSOCIATION,

HELD AT

The Continental Hotel, Philadelphia, Pa.,

SEPTEMBER 16TH & 17TH, 1884.

BROOKLYN:
EAGLE BOOK AND JOB PRINTING DEPARTMENT.
1884.

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CONTINENTAL HOTEL, PHILADELPHIA, PA.

SEPTEMBER 16th and 17th, 1884.

PHILADELPHIA, PA., September 16, 1884.

The Sixth Annual Meeting of the National Telephone Exchange Association was held at the Continental Hotel, in Philadelphia, Pa., on the 16th and 17th of September, 1884.

In the absence of the President, Vice-President William H. Eckert, of New York City, called the Association to order at 11 o'clock A. M.

There were present the following members:

ACTIVE MEMBERS.

AMERICAN BELL TELEPHONE CO., OF BOSTON, Mass.—R. S. Boyd, Special Agent; T. B. Doolittle, Special Agent; Thomas D. Lockwood, Electrician; H. S. Thornberry.

BELL TELEPHONE CO., OF BUFFALO, Buffalo, N. Y.—S. H. Cowles, General Manager; Harlow C. Palmer, Treasurer; E. J. Hall, Jr.

BELL TELEPHONE CO., OF MISSOURI.—George F. Durant, General Manager.

BELL TELEPHONE CO., Philadelphia, Pa.—Henry Bentley, Samuel M. Plush, T. E. Cornish, J. E. Kingsley.

CENTRAL DISTRICT AND PRINTING TELEGRAPH CO., Pittsburg, Pa.—Henry Metzger, General Manager.

CENTRAL PENNSYLVANIA TELEPHONE AND SUPPLY CO., Williamsport, Pa.—H. R. Rhodes, President; R. M. Bailey, General Manager.

CITY AND SUBURBAN TELEGRAPH ASSOCIATION & BELL TELEPHONE CO., Cincinnati, O.—George N. Stone, Vice-President and General Manager.

COLORADO TELEPHONE CO., Denver, Col.—E. B. Field, General Manager.

CHICAGO TELEPHONE CO., Chicago, Ill.—C. N. Fay, General Manager.

CENTRAL UNION TELEPHONE Co., Chicago, Ill.—George L. Phillips.

CHESAPEAKE & POTOMAC TELEPHONE Co., Washington, D. C.—Samuel M. Bryan, General Manager.

CENTRAL NEW YORK TELEPHONE AND TELEGRAPH Co., Utica, N. Y.- C. A. Nicholson, G. B. Shepard, H. L. Storke.

COMMERCIAL TELEPHONE Co., Albany, N. Y.—A. B. Uline, General Manager; William H. Cull, Superintendent.

CUMBERLAND TELEPHONE AND TELEGRAPH Co. AND GREAT SOUTHERN TELEPHONE AND TELEGRAPH Co., Nashville, Tenn.—E. S. Babcock, Jr., President; E. T. Baker, Secretary and Treasurer.

DELAWARE & ATLANTIC TELEPHONE & TELEGRAPH Co., Philadelphia, Pa.—James Merrihew, President; W. T. Westbrook, Superintendent.

EAST TENNESSEE TELEPHONE Co., New York City.—D. I. Carson, Secretary.

EMPIRE STATE TELEPHONE AND TELEGRAPH Co., Auburn, N. Y.—H. L. Storke, Ferd. C. Timpson.

HUDSON RIVER TELEPHONE Co., New York City.—James Bigler, H. L. Storke, A. B. Uline.

METROPOLITAN TELEPHONE AND TELEGRAPH Co., New York City.—William H. Eckert, General Superintendent.

MISSOURI AND KANSAS TELEPHONE Co., Kansas City, Mo.—George L. Phillips.

MICHIGAN TELEPHONE Co., Detroit, Mich.—W. A. Jackson, General Manager.

NEBRASKA TELEPHONE Co., Omaha, Nebraska.—Flemon Drake, General Manager.

NEW YORK AND NEW JERSEY TELEPHONE Co., Brooklyn, N. Y.—W. D. Sargent, General Manager; J. C. Reilly, Superintendent Long Island Division; C. H. Barney, Superintendent New Jersey Division.

NEW YORK AND PENNSYLVANIA TELEPHONE AND TELEGRAPH Co., Elmira, N. Y.—W. N. Eastabrook, General Manager.

NEW ENGLAND TELEPHONE Co.—L. N. Downs, General Manager.

NORTH PENNSYLVANIA TELEPHONE Co., Scranton, Pa.—R. M. Bailey, General Manager.

OHIO VALLEY TELEPHONE Co., Louisville, Ky.—J. B. Speed, President; James Clark, Vice-President and Treasurer; H. N. Gifford, Manager.

PACIFIC BELL TELEPHONE Co., San Francisco, Cal.—John I. Sabin.

PROVIDENCE TELEPHONE Co., Providence, R. I.—John W. Duxbury, General Manager.

PENNSYLVANIA TELEPHONE Co., Harrisburg, Pa.—John L. Wilson, William Ker, General Manager.

SOUTHERN BELL TELEPHONE AND TELEGRAPH Co., New York City.—D. I. Carson, General Superintendent; C. E. McClues, District Superintendent; J. D. Easterlin, District Superintendent; W. J Cole, District Superintendent.

SOUTHERN MASSACHUSETTS TELEPHONE Co., New Bedford, Mass.—Samuel Ivers, Treasurer.

SOUTHERN NEW ENGLAND TELEPHONE Co.—Morris F. Tyler, President; H. P. Frost, General Manager; E. B. Baker, Superintendent.

UNITED TELEPHONE Co., Kansas City, Mo.—George L. Phillips.

WISCONSIN TELEPHONE Co., Milwaukee, Wis.—H. C. Haskins, Secretary.

HONORARY MEMBERS.

AMERICAN BELL TELEPHONE Co., Boston, Mass.
BAILEY, C. E., Engineer, Central Telephone Co., of Havana.
BELL TELEPHONE CO., OF CANADA.—C. F. Sise, Vice-President.
BRIDGEPORT BRASS Co., Bridgeport, Conn.—Frederick A. Mason, Treasurer.
BEETLE, GEORGE L., Chicago.
BERTHON, A., Ingenieur Chef des Services Techniques de la Societe Generale des Telephones, Paris, France.
CHERRY, E. V., Vice-President Standard Electrical Works, Cincinnati, O.
CHEEVER, CHAS. A., New York.
CHILDS, WM. A., New York City.
CASSIDY, JOHN, General Superintendent Hawaiian Bell Telephone Co., Honolulu, H. I.
DAY, A. G., C. B. Hotchkiss, New York City.
KNIGHT, FRANK B., General Agent Palmer Wire Co ; F. F. Bullard, General Manager, Palmer, Mass.
LAW TELEGRAPH CO.
LOCKWOOD, THOMAS D., Electrician, Boston, Mass.
MAYNARD, GEORGE C., Washington, D. C.
MCCONNELL, J. F., Pittsburg, Pa.
PHILLIPS, GEORGE L., Dayton, O.
PHILLIPS, E. F., Providence, R. I.
PALMER WIRE Co.—F. F. Bullard, General Manager ; F. B. Knight, General Agent.
POST & Co. (Standard Electrical Works), Cincinnati, O., represented by E. V. Cherry.
SAWYER, W. H., Providence, R. I.
SUNSET TELEPHONE AND TELEGRAPH, of California.
WESTERN ELECTRIC Co., Chicago, Ill.

FIRST DAY'S PROCEEDINGS.

MORNING SESSION.

The Association was called to order at 11 A. M. by the Vice-President, William H. Eckert, Esq., of New York City. The Chair opened the business of the meeting as follows:

GENTLEMEN—The Sixth Meeting of the Telephone Exchange Association will come to order. The roll has been called, and the first business before the Association is the reading of the report of the Secretary.

The Secretary read his report as follows:

SECRETARY'S REPORT.

To the National Telephone Exchange Association:

GENTLEMEN—The business of the Association has been uneventful for the past year. Your Executive Committee has elected to active membership, subject to the confirmation of the Association, the New England Telephone & Telegraph Co., and the Erie Telephone & Telegraph Co.

Under a resolution passed by the last meeting of the Association, concerning members of the Association which have passed out of existence owing to consolidation and purchase, the resignations of the following members have been entered as if tendered, and their names stricken from the rolls:

Akron Telephone Exchange, Akron, O.
Allaire & Reyburn, Peoria, Ill.
American Bell Telephone Exchange, Jamestown, N. Y. (Dues remitted.)
American District Telegraph Co., Albany, N. Y.
American District Telegraph & Telephone Co., Louisville, Ky.
American District Telegraph Co., Utica, N. Y. (Dues remitted.)
Bell Telephone Co., Chicago, Ill.
Bloomington Telephone Co., Bloomington, Ill.
Boston & Northern Telephone Co., Lowell, Mass.
Carnes & Ross, Memphis, Tenn.
Central Massachusetts Telephone Co., South Framingham, Mass.
Central Telephone Co., Chicago, Ill. (Dues remitted.)
Cleveland Telephone Co., Cleveland, O.

Clinton & Lyons Bell Telephone Co., Clinton, Iowa. (Dues remitted.)
Columbus Telephone Co., Columbus, O.
Connecticut Telephone Co., New Haven, Conn.
Cumberland Telephone Co., Nashville, Tenn.
Cumberland Telephone Exchange, Cumberland, Md.
Davis & Watts, Baltimore, Md. (Dues remitted.)
Dayton Telephone Co., Dayton, O.
Dean & King, Jacksonville, Ill.
Dunkirk Telephone Exchange, Dunkirk, N. Y. (Dues remitted.)
Eastern Pennsylvania Telephone Co., Reading, Pa. (Dues remitted.)
Elmira Bell Telephone Exchange, Elmira, N. Y. (Dues remitted.)
Evansville Telephone Exchange, Evansville, Ind. (Dues remitted.)
Easton Telephone Co., Easton, Pa. (Dues remitted.)
Hampden Telephone Co., Springfield, Mass. (Dues remitted.)
Haskins, C. H., Milwaukee, Wis. (Dues remitted.)
Hawkeye Telephone Co., Cedar Rapids, Ia. (Dues remitted.)
Iowa Telegraph & Telephone Co., Cedar Rapids, Ia.
Ithaca Telephone Co., Ithaca, N. Y. (Dues remitted,)
Leavenworth Telephone Exchange Co., Leavenworth, Kan. (Dues remitted.)
Long Island Telephone Co., Brooklyn, N. Y. (Dues remitted.)
Loomis & McDaniels, Joplin, Mo.
Louisiana Telephone Co., New Orleans, Mo.
Lowell District Telephone Co., Lowell, Mass.
Lumbard, S. C., Fort Wayne, Ind.
Marshalltown Telephone Co., Marshalltown, Ia. (Dues remitted.)
Marvin, R. N., Jamestown, N. Y.
Maryland Telephone Co., Baltimore, Md. (Dues remitted.)
Massachusetts Telephone Co., South Framingham, Mass. (Dues remitted.)
Memphis Telephone & Electric Co., Memphis. (Dues remitted.)
Midland Telephone Co., Chicago, Ill.
Milwaukee Telephone Exchange Co., Milwaukee, Wis. (Dues remitted.)
National Capital Telephone Co., Washington, D. C.
Newburgh Telephone Co., Newburgh, N. Y. (Dues remitted.)
Newell, Frank A., Bradford, Pa. (Dues remitted.)
New Jersey Telephone Co., Jersey City, N. J. (Dues remitted.)
New Milford Bell Telephone Co., New Milford, Ct. (Dues remitted.)
Northwestern Telephone Co., Minneapolis, Minn.
National Bell Telephone Co. of the State of Maine, Lowell, Mass.
Omaha Electric Co., Omaha, Neb.
Paige & Elwood, Joliet, Ill.
Rhoades & Kinsey, Wilkes-Barre, Pa.
Ross, James P,, Nashville, Tenn. (Dues remitted.)
Southern Ohio Telephone Exchange, Ironton, O. (Dues remitted.)
Southwestern Telegraph & Telephone Co., Little Rock, Ark.
Spang, Henry W., Reading, Pa. (Dues remitted.)
Springfield Telephone Co.. Akron, O.
Springfield Telephone Co., Springfield, Mass.

St. Johnsbury Telephone Co., St. Johnsbury, Vt. (Dues remitted.)
St. Joseph Telephone Exchange, St. Joseph, Mo. (Dues remitted.)
Storke, H. L., 197 Broadway, New York. (Dues remitted.)
Telephone Dispatch Co., Boston, Mass.
Telephone Exchange Co., Baltimore, Md. (Dues remitted.)
Toledo Telephonic Exchange, Toledo, O.
Union Telephonic Exchange Co., Norwalk, O. (Dues remitted.)
Vaille, Frederick O., Denver, Col.
Waterbury Automatic Signal Telegraph Co., Waterbury, Conn. (Dues remitted.)
Western Massachusetts Telephone Corporation, Pittsfield, Mass. (Dues remitted.)
Western Telephone Co., Chicago, Ill.
Youngstown Telephone Co., Akron, O.

This reduces the actual membership of the Association to the roll of names given in the Report of the Fifth Meeting, and brings to mind the amendments proposed at that meeting to be voted upon this year. These amendments are as follows:

"That Article III. of the Constitution be amended by striking out the first clause and inserting the following: 'The members of this Association shall be Directors or General Officers not below the rank of Superintendent, of corporations holding exchange licenses from the American Bell Telephone Co., or individuals holding such license. Each member shall be entitled to one vote, and corporations now holding memberships may transfer the same to their proper representatives—one representative being allowed for each vote heretofore held.'"

Also:

"That Article VI. of the By-laws be amended by striking out everything before the word 'together,' and inserting the following: 'Whenever any individual desires to become a member of this Association, he shall make application for membership and forward the same to the Secretary.' The remainder of the article being as heretofore."

Proposed by Mr. Eastabrook: "That the Convention at its annual meetings, by a two-thirds vote of the members present, shall designate the time of holding the next Annual Convention."

We hand you herewith Report of the Treasurer showing:

Balance in hand of	$708.54
Annual dues against members amounting to	250.00
Total assets	$958.54

LIABILITIES:

Salary Secretary	$300.00
Current expenses	

We voted the Secretary a salary of three hundred dollars for the past year.

The financial condition of the Association is therefore, as heretofore, satisfactory.

C. N. FAY, *Sec'y.*

NATIONAL TELEPHONE EXCHANGE ASSOCIATION,

TREASURER'S REPORT,

Covering Receipts and Disbursements from October 15th, 1883, to September 12th, 1884.

1883.		
Oct. 15.	—To cash in hand	$977 66
" 23.	—Empire State Tel. & Tel. Co., Dues, 1883	10 00
" "	Central N. Y. Tel. & Tel. Co	10 00
" "	Hudson River Tel. & Tel. Co	10 00
" "	So. Mass. Telephone Co	10 00
" "	Pennsylvania Telephone Co	10 00
" "	" " " Initiation Fee	10 00
" "	Geo. L. Beetle, Honorary Member	25 00
" "	H. B. Lytle, refunded account excess horse-car hire paid Boston, 1882	6 00
" "	D. B. Zarker, Commission Reports	2 00
" "	H. N. Gifford, " "	1 00
" "	Easton Tel. Co., Dues, 1883	10 00
" "	" " " Initiation Fee paid Tyler in 1882, not entered	10 00
Nov. 12.	—Am. Dist. Tel. Co., Syracuse, N. Y., Dues, '83	10 00
" 13.	—Loomis & McDaniel, Joplin, Mo., " "	10 00
" 15.	—Boston & Northern Tel. Co., " "	10 00
" 16.	—Great So. Tel. & Tel. Co., " "	10 00
Dec. 9.	—Erie Telephone Co., " "	10 00
	Carried forward	$1,141 66

1883.				
Oct. 17.	—C. N. Fay, Salary	Voucher No.	37..	$300 00
Nov. 24.	—Tellet & Bicot, Stenographers,	" "	38..	105 95
Dec. 14.	—H. L. Storke	" "	15..	18 60
1884.				
Mar. 15.	—W. D. Sargent	" "	39..	27 00
" 27.	—Brown, Pettibone & Kelly	" "	40..	139 32
" "	C. N. Fay, Secretary	" "	41..	7 50
June 9.	—W. D. Sargent	" "	42..	50 00
Sept. 5.	— " " Chairman	" "	43..	100 00
" "	C. N. Fay	" "	44..	8 00
" "	" "	" "	45..	2 00
" "	F. G. Beach	" "	35..	2 00
				$760 37
Sept. 12.	—Balance cash on hand			$708 54

1884.	Brought forward.....			$1,141 66
Aug. 25.—	Colorado Telephone Co.,	Dues, '84	.	10 00
" "	Michigan " "	" "	..	30 00
" "	Bell Telephone Co., of Mo.,	" "	..	10 00
" "	Iowa Union Tel. & Tel. Co.,	" "	..	10 00
" "	Wisconsin Telephone Co.,	" "	..	10 00
" "	Erie Tel. & Tel. Co.,	" "	..	10 00
" "	East Tenn. " "	" "	.	10 00
" "	So. Bell Tel. & Tel. Co.,	" "	..	10 00
" "	Nebraska Telephone Co.,	" "	..	10 00
" "	Chicago " "	" "	..	10 00
" "	Am. Dist. Tel. & Tel. Co.,	" "	..	10 00
" "	City & Sub. Tel. Asso.,	" "	..	30 00
" "	Ohio Valley Tel. Co.,	" "	..	10 00
" 30.—	Central Penn. Tel. & Supply Co.,	" "	..	10 00
" "	N. Y. & Penn. Tel. Co.,	" "	..	10 00
" "	Commercial Tel. Co.,	" "	..	10 00
" "	Penn. Tel. Co.,	" "	..	10 00
" "	Metropolitan Tel. & Tel. Co.,	" "	..	30 00
Sept. 2.—	Received from N. Fay, Secretary,	" "	..	17 25
" 5.—	Bell Telephone Co., of Phila.,	" "	..	20 00
" "	Hudson River Tel. Co.,	" "	..	10 00
" "	Delaware & Atlanta Tel. &. Tel. Co.,	" "	..	10 00
" "	N. Y. & N. J. Tel. C.,	" "	..	10 00
" 12.—	United Tel. Co.,	" "	..	10 00
" "	Mo. & Kansas Tel. Co.,	" "	..	10 00
				$1,468 91

THE CHAIR—Gentlemen, the report of the Secretary is before the meeting. What is your pleasure concerning it?

MR. STORKE—I move that the report be received, adopted and placed on file.

The motion was agreed to.

THE CHAIR—The next business is the election of members, and nominations are in order.

MR. DURANT—Does the adoption of the report of the Secretary confirm the election and resignation of the new members who are named in that report? If it does not, there ought to be some further action in reference to that subject.

THE CHAIR—It does not. Will you make a motion in reference to that matter?

MR. DURANT—I move that the action of the Executive Committee be confirmed accepting the resignations of members named in the report and electing new members.

The motion was unanimously agreed to.

MR. PHILLIPS—We have with us this morning Mr. A. Berthon, Chief Engineer of the General Telephone Co. of France, and I, therefore, move you, Mr. President, that we elect him an honorary member of this Association, and that the Secretary be instructed to draw an order on the Treasurer for his dues.

MR. GIFFORD—I second the motion.

MR LOCKWOOD—I was about to second the motion, but since a better man than myself has done so I will not do it.

Mr. Berthon was thereupon unanimously elected.

MR. BERTHON—I feel very much honored by the compliment, and you may be assured that I will be a member entirely devoted to the interests of the Association.

MR. SABIN—I move that Mr. John Cassidy, General Superintendent of the Hawaiian Telephone Company, be elected an honorary member of this Association, and as the gentleman himself cannot probably come here again, I will also move that the Secretary pay his dues.

THE CHAIR—Mr. Sabin moves Mr. John Cassidy, representing the Telephone Company of the Sandwich Islands, be

made an honorary member of this Association without the payment of dues.

The motion was seconded and Mr. Cassidy unanimously elected.

MR. CASSIDY—Gentlemen, I thank you for the honor of becoming a member of this Association. I have been for a long time connected with the Bell Telephone Company. In fact, we are the Bell Telephone Company.

MR. SABIN—For the benefit of the members who are a little weak-kneed I would like to report that Mr. Cassidy has a telephone exchange in the Sandwich Islands, where the telephone is free; that is to say, there is no patent or royalty, and the opposition have come there with considerable money, have spent all their money, but have done absolutely nothing. I do not know what Company it is that has come there, but they have met with this opposition.

MR. PHILLIPS—What is the rate?

MR. CASSIDY—It is sixty dollars a year for business houses, forty dollars for private residences, and ten dollars a month for plantations and other places outside.

THE CHAIR—The next business in order is the election of officers.

MR. PHILLIPS—I nominate Morris F. Tyler for re-election as President of this Association.

MR. SABIN—I second the motion.

THE CHAIR—Are there any other nominations?

MR. METZGER—I move the nominations close.

MR. PHILLIPS—As our By-Laws call for a vote by ballot I move that the Secretary of the Association be instructed to cast our ballot for Morris F. Tyler for President.

MR. SABIN—I second the motion.

The motion was agreed to, and the Secretary depositing a representative ballot, the Chair declared Morris F. Tyler elected President of the Association.

THE CHAIR—The next business in order will be the nomination for Vice-President.

MR. LOCKWOOD—I have the honor to present the name of our good friend, Henry Metzger, of Pittsburg.

MR. METZGER—I respectfully decline the honor, and I hope that the Association will recognize the services of Mr. Eckert of New York by re-electing him to the office which he has so acceptably filled during the past year.

MR. LOCKWOOD—I withdraw my motion.

THE SECRETARY—The motion seems to be embarrassing, Mr. Eckert, and I will therefore rise and put the question for him. Do I understand the motion to be intended to be acted upon in a similar way to the last one?

MR. METZGER—I move that the Secretary be authorized to deposit the vote of the Association for William H. Eckert for Vice-President.

THE SECRETARY—Gentlemen, you hear the motion. All in favor of it will express your preference in the usual manner. The motion is agreed to, and the Secretary will cast the ballot for Mr. Eckert, who is accordingly elected Vice-President of this Association for the coming year.

MR. METZGER—Now, let us have a speech from the Vice-President.

THE CHAIR—It is a very hard matter to get through with this business, let alone make a speech. The next business in order will be the nomination and election of a Secretary for the ensuing year.

MR. SABIN—I nominate Mr. C. N. Fay, of Chicago, and I take the liberty of moving that the Chair put the question in respect to that gentleman, as I know it would be embarrassing to him to put it for himself.

MR. FAY—I am very sorry; but I have served for two years as Secretary, and I really cannot consent to serve another year. It is a great pleasure to have served the Association, but the deal ought to pass into some other hands.

MR. STORKE—If Mr. Fay really means that——

THE SECRETARY—I really mean that.

MR. STORKE—Then, and under no other circumstances, I would nominate for Secretary of this Association Mr. W. D. Sargent, of Brooklyn. If there is no objection I ask that the ballot be taken in this case as it has been taken in the case of the President and the Vice-President.

THE CHAIR—Mr. W. D. Sargent, the General Manager of the New York & New Jersey Telephone Company, has been nominated for Secretary. All in favor of that motion will signify their consent by saying aye. Mr. Sargent is unanimously elected as Secretary.

MR. SARGENT—Mr. Chairman and gentlemen, I am very much obliged to you indeed for this honor. I shall be very proud to follow in the path of your late Secretary, and I hope I shall be able to serve you as well. That shall be my earnest endeavor.

THE CHAIR—Now we will have an election for Treasurer.

MR. STONE—I desire to nominate for Treasurer Mr. H. L. Storke, of New York.

MR. METZGER—I second the nomination.

THE SECRETARY—Mr. Storke has spoken across the table, as the gentlemen of the Association have probably noticed, in a clandestine manner to the Secretary, something about Mr. Beach, who has been the Treasurer for the past year. Mr. Beach authorizes me to say that he does not wish to act as Treasurer for another year. I have his letter here which I will read. His name is not in nomination, and I simply read it in order to settle any scruples which Mr. Storke may have. Mr. Beach says :

CENTRAL UNION TELEPHONE CO. }
CHICAGO, September 13, 1884. }

C. N. FAY, *Secretary National Telephone Exchange Association :*

Enclosed find Treasurer's Report covering receipts and disbursements from October 15th, 1883, to September 12th, 1884, inclusive : also orders 44 and 45, which kindly return to me after having them endorsed by President Tyler.

We are literally swamped with work at present, and I fear I shall not be able to attend the approaching Convention. I regret this very much, as there will, no doubt, be many matters of mutual interest and information under discussion.

As regards the office of Treasurer for the ensuing year, I would, of course, be glad to serve the Association in any manner consistent, but think the best interests of the Association would be subserved by having the selection and location of Treasurer dependent upon the location of the Secretary.

Yours, very respectfully,

F. G. BEACH,
Treasurer N. T. E. A."

Mr. Beach is emphatically right in that. The Secretary's

and Treasurer's duties are so closely associated that they ought to be from the same locality, or the immediate neighborhood.

THE CHAIR—The question is upon the election of Treasurer. It has been moved and seconded that Mr. H. L. Storke, of New York, be elected Treasurer of this Association for the coming year, and that the ballot in this case be taken in the same way as the others have been. Is the Association ready for the question? Those in favor of the motion will say aye. It is unanimously agreed to, and Mr. Storke is elected the Treasurer of this Association. The next thing in order is the nomination of a member of the Advisory Committee for three years, in place of W. D. Sargent, of Brooklyn, who goes out.

MR. PHILLIPS—As all of the officers have gone down East, suppose we go out West for a member of the Advisory Committee, and put in W. A. Jackson, of Detroit. He has dead loads of good advice, and I know it, and I therefore nominate him.

Mr. Jackson was unanimously elected.

THE CHAIR—The next business in order is the election of an Executive Committee. The President is, *ex-officio*, a member of that committee; W. A. Jackson, of Detroit; H. L. Storke, of New York; A. D. Bullock, of Cincinnati, and Henry Metzger, of Pittsburg, being the remaining members. There are four vacancies there, and nominations will be in order.

MR. GIFFORD—I nominate Mr. James Bigler, of Newburgh, N. Y.

MR. METZGER—I nominate H. N. Gifford, of Louisville, Ky.

DR. BAKER—I nominate Henry Metzger, of Pittsburgh.

MR. PHILLIPS—I nominate Mr. W. N. Eastabrook, of Elmira, N. Y.

MR. STONE—There is one gentleman already from the State of New York, and I think we ought to divide the offices.

THE CHAIR—Are there any other nominations? There

being no other nominations the Chair will put the question on the election of Messrs. Bigler, Gifford, Metzger and Eastabrook. Is the Association ready for the question? Those in favor of the election of these gentlemen as members of the Executive Committee will say aye. They are so elected.

THE SECRETARY—The President of the Association succeeds himself, and is not present. The Vice-President of the Association succeeds himself, is present, but declined to make a speech. The Secretary is the first man who has the honor of retiring, and he begs the privilege of leading to the chair his successor, Mr. Sargent, with the request that he make a speech.

MR. SARGENT—Since the first two officers of the Association have declined to make a speech, and Mr. Fay has unkindly thrown the burden on me, I think the Association ought to be merciful and excuse me.

MR. SABIN—No, sir.

MR. DURANT—I move that Mr. Sargent be allowed ten minutes by the watch.

MR. SARGENT—I desire to remind you that I am Chairman of the Committee on Statistics, and if you will try to imagine the work that is required from the Chairman of that Committee and the volume of papers which I have in my room, the length of the report which I have to read to you later on, you will reconsider that and not give me one minute nor one second.

MR. FAY—It has been customary in past years to appoint a Committee upon the place and date of the next meeting of the Association, and also upon the hours of sessions of this meeting. I therefore move that the Chairman designate such a Committee, with instructions to report at the afternoon session of to-day—a Committee of three.

The motion was agreed to, and the Chair appointed as the Committee Messrs. C. N. Fay, George F. Durant and D. I. Carson.

THE CHAIR—The next business will be the consideration of amendments to the Constitution.

MR. SABIN—Will the Chair have the amendments read?

MR. FAY—As a matter of form, I would suggest that now is an appropriate time to act on the amendments to the Constitution that were proposed at the last session. They are in the hands of the Secretary, and in the regular order of business they would come up at this time. We have, perhaps, time enough before the recess to take them up before the reports of the regular Committees.

MR. DURANT—I move that the amendments be taken up *seriatim*.

(Here the President entered the room and assumed the chair, saying, amid applause and laughter, "It is not my fault, gentlemen; it is the Pennsylvania Railroad Company's.")

MR. FAY—I ask the privilege of calling upon the *late* President, who is the *present* President, to make a speech.

THE PRESIDENT—I did not intend to make a speech, and I do not intend to make a speech now. I regret that I did not get here earlier in order to inform you, in time, that I could not serve you for another year. I certainly did not mean to dodge that matter, but really intended to cast my vote in that case for prohibition of further service; but it is gratifying to me on coming here to find that you have done me the honor to elect me for another year. I hope I shall survive the duties of this session, and transmit the Association in good health and vigor another year to some one more worthy to preside over your meetings. I could make a speech, possibly, to you as telephone men, on the history of the last year and on the prospects of the year to come.

MR. SABIN—That is what we want.

THE PRESIDENT—But I am afraid that my *resumé* of the past might cause some of you to renew old griefs, and make some of you even more down-hearted than you have been during the past year. My prophecy for the year to come might possibly be untrue, and then you would be full of disappointed hopes; so I think I had better say nothing except this one word, which I want to say in all seriousness: We all recognize that during the past year the telephone has had a hard time. Some of us have had a great deal harder time

than others. We recognize that we are in a stress of weather in the history of the business, owing to two or three causes, due to the financial condition of the general market, due to the unsettled condition of the basis of our business because of litigation, due, for another cause, to the uncertainty which some of us have entertained as to the wisdom of our relations with our licensor. I think those are the three causes which have occasioned the trouble, the disturbance and the check in the prosperity of the business which we have all more or less experienced. Of course, one of them, the financial difficulty, must be temporary. It is impossible that the present depression should last forever, or, indeed, should last any very long time. The time is coming, certainly, in this country when money will be as ready for investment as it was in 1880, 1881 and 1882. It is only a question, then, for us to put the telephone business into such shape that money, when it is ready, will seek investment in that direction. As regards the matter of patents and litigation, I have paid a great deal of attention to that. I have been obliged to do so, living pretty near Boston, and being surrounded by a set of stockholders who are more or less cantankerous on the subject of the Bell patent: and I believe that the Bell patent is going to sustain its position in the United States Courts against all the antagonists who have yet appeared in the field. I may be mistaken, but that is the opinion I have arrived at. It is not paid for, and I will not say that it is disinterested; but, if the patent stands, that removes another cause of our difficulties, and then comes the question of our relation to the American Bell Telephone Company. That is a very serious question, as to whether the business can be sustained for the benefit of local stockholders and upon the basis on which most of us are placed in relation to the licensor. But, if the patents are sustained, let us look at them in this way There is only one rule in law which governs a patentee in the disposition of his patent, and that rule is the very simple one of his pecuniary profit. The American Bell Telephone Company, as owners of the patent and patentees, have said that their pecuniary

profit lay in a certain line of policy, and as they held "the earth" we had to submit. We come between them and the public. We have upon us, by their will, and not by ours, a certain series of fixed charges. There is only one way in which this question can be met. It is not by squabbling with the American Bell Telephone Company. It is not by sitting down and groaning over our royalties, or over the stock we have to pay for; but it is, when settled, by saying to the public, "This thing costs so much. We do business for a profit, and you must pay our price, which is a price which will pay us, and if you do not pay that price you do not get the business." In other words if, as the sole owner of the right of telephoning in this country, the American Bell Telephone Company raises the price, the public have to pay it or go without their service. I have come very solidly to that conclusion myself, for, big exchanges or little exchanges, if this matter is settled in favor of the American Bell Telephone Company a substantial inevitable increase in charges must follow. The people who hold the stock in this Company must insist upon getting their money, or insist upon not giving their goods, and the result will be that after a short time of flurry, or kick, the business of telephony will come into a perfectly solid, substantial basis, there to stay. The result will be that our stocks will go up, and we can pay our notes.

Now, if Mr. Durant will renew his motion we will go on with the business of the morning.

MR. DURANT—My motion is, that the amendments to the Constitution, referred to in the report of the Secretary, be now taken up *seriatim*.

MR. CHERRY—I second the motion.

THE PRESIDENT—The first amendment is to Section 1st of Article III. of the Constitution, which reads as follows:

"The members of this Association shall be such companies or individuals as hold exchange licenses or authority from the American Bell Telephone Company; and in the meetings of the Association each member shall be entitled to one vote for each exchange operated by such company or individual, but there shall be but one exchange within the corporate limits of any city or town entitled to a vote."

It is moved to strike out that clause and to insert the following:

"The members of this Association shall be directors, or general officers, not below the rank of Superintendent, of corporations holding exchange licenses from the American Bell Telephone Company, or individuals holding such licenses. Each member shall be entitled to one vote, and corporations now holding memberships may transfer the same to their proper representatives, one representative being allowed for each vote heretofore held."

MR. FAY—I presented that amendment to the Association last year, looking to the placing of the Association on a permanent basis. The difficulty which I foresaw in the life of the Association was, that it is and always has been composed of corporations, and by the process of merging, of which you had so marked an illustration in the Secretary's report presented at this meeting, we have lost a far greater number of members than we now retain. At present there are about forty names of corporations who are members of the Association—active, supporting members. Mr. Durant, in calling up these amendments, stated that they were recommended by the Secretary, or by the Executive Committee, I forget which. That is not strictly true, and as a member of the Executive Committee I wish to correct any misunderstanding on that point. The Executive Committee had but a brief time to consider these amendments, and did not come to any conclusion on them, but simply allowed them to be presented to the meeting in order that they might be called up in the ordinary course of business. The question is, whether the life of the Association would be better secured if supported by corporations, the number of which is daily decreasing, or whether it would be better secured by being supported by individuals, the number of whom interested in the cause is daily increasing. At the time I submitted the amendments I thought there was no doubt that the permanency of the institution would be secured by having the Association composed of individuals. Since that time I have looked into the workings of the Association formed under the auspices of the Western Union Telegraph Company and the various telephone companies here, and the result has been to unsettle my mind. I do not

know whether, at this time, it will be an advantage to the Association to adopt these amendments or not. However, the subject has come up for discussion, and those members of the Association who have been in the telegraphic business for years, in the American Electric Association, and the other associations fostered by the Western Union Telegraph Company of a somewhat similar character to this, are more competent to judge than I am of the probable permanency of the Association in that form, and I would like to ask those gentlemen to give the Association the benefit of their experience on that question.

MR. STORKE—Will the Secretary please read the article of the Constitution as it now stands?

THE SECRETARY—Section 1st, Article III., on Membership reads as follows:

"The members of this Association shall be such companies or individuals as hold exchange licenses or authority from the American Bell Telephone Company; and in the meetings of the Association each member shall be entitled to one vote for each exchange operated by such company or individual, but there shall be but one exchange within the corporate limits of any city or town entitled to a vote."

MR. STORKE—In discussing this matter in the Executive Committee the drift of the opinion seemed to be that, as the clause now stands, the provision relative to individuals was fully covered by the rule allowing corporations practically to send as many members as they were willing to pay for up to the number of exchanges operated by them. Keeping this Association as it now stands, we can secure, it seems to me, all the new members required, and, at the same time, keep the corporations interested. In sending delegates to this Convention, often over a long distance, it is quite an important thing, in the matter of paying the expenses of delegates, and all that, that the membership should still remain in the corporations. I think the memberships should remain in the hands of corporations and of individuals without change, and to bring the matter before the house I would move to lay the amendment on the table. If that motion prevail, it will throw the matter over for another year, when it can be brought up, if desirable. I

would like to have the matter tried for another year as we are now running. Then, if we find it desirable, we can make the change.

MR. FAY—At the risk of being considered prolix, I would like to go a little further into the reasons for originally introducing this amendment. There were two reasons. The first was the diminution of the number of members, of which I have spoken before, and the second is the great difficulty which the members of the various committees; to whom is submitted the work of procuring the information and statistics which it is the object of the Association to preserve, experience in getting any careful, adequate responses from the members of the Association. The work of the committees has been largely rendered worthless by the apathy of the individual members of the Association, who decline to aid those committees by furnishing them the information which it is in their power to contribute. Furthermore, while all these committees have been generally composed of three or five members: the chairman of the committee, as a matter of practice, has done all the work. Now, the composition of these committees is not a question which the action of this meeting will in any way affect; but, incidentally, the question arises, What is the interest of the Association to these individuals? At present they represent corporations. They are sent here at the expense of corporations and, ordinarily, none of them do anything whatever to render the meeting an interesting one, but depend upon the information gathered by the committees, to which they themselves decline to contribute, and upon any voluntary contributions furnished by individuals. It seems to me that the scientific associations of the country – for instance, the American Association for the Advancement of Science, or the British Association, or any other of the well-known and established associations of the world – are composed of individuals who are interested in the work of the Association, and who contribute their efforts in the shape of carefully prepared papers upon subjects which particularly appeal to each. It was that condition of personal interest in the

Association that, looking to have put forth such a personal endeavor, I thought to secure in this manner, by proposing these amendments, and by suggesting that the membership be changed from a membership of corporations to a membership of individuals. I think there is nobody here who does not take an interest in a well prepared paper. There is no one who prepares a paper or does any work for the Association who does not feel more than rewarded by the interest and gratification expressed by the members at its reception, and it has been a matter of astonishment to me that so few of our members have not taken that interest in the prosperity and welfare of the Association. At the same time it may well be, as Mr. Storke has said, that the aid of the corporations is necessary to the financial support of the Association; but, in considering that, you must also consider whether the men who are sent here to represent them are going to do anything for the money which is expended in sending them here.

MR. SABIN—Will the Secretary read the amendment again?

THE SECRETARY—It is proposed to strike out the first section of Article III. of the Constitution, which reads as follows:

"The members of this Association shall be such companies or individuals as hold exchange licenses or authority from the American Bell Telephone Company; and in the meetings of the Association each member shall be entitled to one vote for each exchange operated by such company or individual, but there shall be but one exchange within the corporate limits of any city or town entitled to a vote."

And to insert the following:

"The members of this Association shall be directors or general officers, not below the rank of Superintendent, of corporations holding exchange licenses from the American Bell Telephone Company or individuals holding such licenses. Each member shall be entitled to one vote, and corporations now holding memberships may transfer the same to their proper representatives, one representative being allowed for each vote heretofore held."

THE PRESIDENT—Gentlemen, will you remark further upon the motion to lay this amendment on the table? The motion is upon the adoption of the motion to lay the amendment upon the table. How shall the vote be taken?

A DELEGATE—I call for a rising vote.

(A rising vote being taken, and the Secretary being directed by the President to count the vote, the Secretary reported twenty-one ayes and three noes, whereupon the President decided the motion to lay the amendment upon the table agreed to.)

THE PRESIDENT—The next business in order is the consideration of the following amendment to the By-Laws:

Resolved, That Article VI. of the By-Laws be amended by striking out everything before the word "together," and inserting the following:

"Whenever any individual desires to become a member of this Association, he shall make application for membership, and forward the same to the Secretary. The remainder of the Article being as heretofore."

With your permission, the Chair will read the Article which it is proposed to amend.

MR FAY—I will say, here, that this is simply a matter of detail to carry out the purpose of the first amendment, and would stand or fall with the first amendment.

THE PRESIDENT—Do you move to lay that on the table?

MR. FAY—I move to lay the second amendment on the table.

THE PRESIDENT—Gentlemen of the Association, you hear the motion made by Mr. Fay, of Chicago. It is to lay upon the table the second amendment. Does any gentleman desire to remark upon the question? Is the Association ready for the question? All in favor of laying the second amendment upon the table will signify their assent by saying aye. It is a vote. The motion is agreed to. The second amendment is laid upon the table.

There is one other amendment, proposed by Mr. Eastabrook, which is as follows:

"That the Convention at its annual meetings, by a two-thirds vote of the members present, shall designate the time of holding the next annual convention."

This amendment is before you for consideration. What will you do with it?

MR. EASTABROOK—As the father of the amendment, I suppose it is proper for me to state the purpose of it. All

who were present at our last annual convention, and at the one the year preceding, will remember the difficulty we had in getting over the Constitution, in order to change the date of our meeting. We did not want to meet at Cincinnati, because it was a little too hot; and we wanted to meet in Providence, because it was time for clams. But after a little study we managed to ride over the breach temporarily, and in order to stop the scolding which then took place for from half an hour to forty-five minutes, I proposed this amendment.

MR. FAY—I agree with Mr. Eastabrook, but I would like to suggest an amendment to his amendment, that is, to substitute the word "association" instead of "convention," With that exception, I think his amendment ought to be adopted.

THE PRESIDENT—That would be right.

MR. FAY—At our first meeting we called ourselves a convention, but we then resolved ourselves into an association. Ever since that the two terms have been mixed up, and bothered the Secretary considerably.

MR. EASTABROOK—I accept the suggestion. The amendment, it seems to me, should properly be a substitute for the first clause of Article XIII.

THE PRESIDENT—As amended, the Article will read:

"That the Association at its annual meetings, by a two-thirds vote of the members present shall designate the time and place of holding the next annual convention."

MR. EASTABROOK — In connection with that, will you please read the balance, Mr. President?

THE PRESIDENT—There is no balance. The report of the last meeting says that the amendment was laid over, and was not acted upon, but left to this meeting. Is a ballot called for upon the adoption of the amendment? If not, the vote will be taken *vive voce*. As many as are in favor of the adoption of the amendment proposed by Mr. Eastabrook will say aye. As many as are of the contrary opinion will say no. There are no dissenting votes. The motion is unanimously agreed to.

MR. LOCKWOOD--Before taking a recess this morning, I would like to bring to the notice of the Association, and to yourself, Mr. President, the fact that in one of the morning papers published in this city, the Philadelphia *Times*, we were characterized as being an association for the protection of our interests against adverse legislation, and the item to which I refer went on to state that if the Bell Telephone Company paid as much attention to service as they did to that purpose it would be better for the subscribers. While we have been unmasked in this ruthless manner as the proprietors of a bloated monopoly, and the right bower of centralization, I think it is better, even though we know ourselves as well as we do, out of decent respect for the opinions of mankind, to still hide our purpose as much as we can, and to that end I would request the Secretary to read the preamble to this Association, so that those of us who are present may know what we are present for, and so that outsiders may know.

THE PRESIDENT—The Secretary will read the preamble.

The Secretary read as follows :

"THE OBJECT OF THIS ASSOCIATION.

This Association is formed for the purpose of collecting, preserving and protecting all matters of importance to telephone interests."

THE PRESIDENT—Gentlemen, what further business have you to bring before the Associatfon ?

MR. STORKE—At the time of the organization of the Association and the arrangement of the committees whose business it was to gather together and bring before the Association the matters of importance alluded to in that preamble, our business was new, and some things were perhaps covered in that list of committees that it is not now necessary to go into very much, and other things have been omitted from that list into which it would now be very proper for us to inquire, and I would move that a Committee of five be appointed (waiving any privilege of the mover) to go over that list of committees, and the method of doing that portion of our business, the Committee being instructed

to report at an early day of this session for the consideration of the Association.

THE PRESIDENT—Gentlemen, you hear the motion. It is that a Committee of five be appointed for the purpose substantially of revising the subjects of the appointment of Standing Committees of this Association. Is that motion seconded?

SEVERAL DELEGATES—I second the motion.

MR. FAY—Do I understand the motion of Mr. Storke correctly? Is it for the purpose of revising the subjects submitted for the consideration of the committees, or does the motion relate to the reorganization of the committees entirely?

MR. STORKE—What I meant to cover was to look into that whole matter, and, if necessary, to revise the method of bringing business before the Convention. That is practically covered by the motion.

THE PRESIDENT—The motion is that a Committee be appointed with reference particularly to the manner in which business shall be brought before this Association at its meetings.

MR. LOCKWOOD—The motion is undoubtedly a very proper one. I myself have been embarrassed with the extremely unreliable character of the information given by the Committees to the Association, as well as the way of getting at that information. I have been on several committees, and while I did not exert myself to any great extent in trying to get information, and while I have not met with unexampled encouragement, but with great difficulty in getting information, and have been generally obliged to draw on my own resources, taking notes as I went along, I have been led to think whether it would not be best to drop the committee business altogether and to rely upon the individual efforts of each member. I think if there was more pressure brought upon the members collectively they would feel as if they had more interest in this matter, and that they would exert themselves in bringing before this Association the information that we all desire.

MR. STORKE—I think we would need some committees, in any event.

THE PRESIDENT—I think the motion is wide enough to allow the Association plenty of room on the subject. Gentlemen of the Association, are you ready for the question? Those in favor of the motion will say aye. The motion is agreed to. The Chair will announce the Committee at the afternoon session.

MR. PHILLIPS—I move that we take a recess until two o'clock.

THE SECRETARY—Mr. Doolittle, of the Committee of Arrangements, desires me to say that the members may have free tickets of admission to the Electric Exhibition, upon application to the Secretary any time after the adjournment of the meeting.

MR. FAY—I presume this courtesy is extended by the local management; that is, by the Franklin Institute, is it not?

THE SECRETARY—I so understand.

MR. FAY—I move that the thanks of the Association be tendered to the managers of the Franklin Institute for the courtesy shown to the Association, and that the Secretary be instructed to transmit the same to them.

The motion was unamimously agreed to.

MR. EASTABROOK—I move to amend the motion for a recess by striking out two o'clock, and inserting 2:30.

MR. DURANT—If we say two, it will be three before the members get here. If we say three, it will be four. Therefore, I think we should allow it to remain at two, and then there will be a probability of our meeting at three.

THE PRESIDENT—If the Association adjourns to meet at half-past two o'clock, the Chair will endeavor to call the meeting to order at that time.

MR. DURANT—In that case, I will have no objection to the motion; but I hope that the President will be prompt in calling the members to order.

THE PRESIDENT—I will get a bell.

The motion to take a recess until 2:30 P. M. was agreed to,

and the meeting of the Association was therefore declared adjourned until that hour.

AFTERNOON SESSION.

The Association re-assembled at 2:30 P. M.

THE PRESIDENT—The Association will please come to order. Before calling for the reports of the committees, which will be the next regular order of business, there is now an opportunity afforded for the introduction of any resolutions which may have been omitted this morning, and which anyone may desire to present now, or if there are any names to be presented for membership, or anything of the kind, the Chair is ready to receive motions.

MR. LOCKWOOD—There is a gentleman here from Havana, and I propose him for honorary membership, Mr. C. E. Bailey, Engineer of the Central Telephone Company, of Havana. It is not likely that the gentleman will be able to participate to any great extent in the advantages to be obtained from this Association, and I move that the Secretary be instructed to pay the initiation fee.

The motion was unamimously agreed to.

THE PRESIDENT—Is there any other general business to be brought before the Association?

MR. ECKERT—I move the election of Mr. J. T. McConnell, of Pittsburg, Pa., as an honorary member.

THE PRESIDENT—It is moved and seconded that Mr. McConnell, of Pittsburg, be elected to honorary membership. Those in favor will say aye; contrary, no. Mr. McConnell is unanimously elected. Are there any other motions to be submitted to the Association before the reports of committees are called for?

MR. FAY—I desire to nominate for honorary membership the Palmer Wire Company, of Palmer, Mass. I believe Mr. F. B. Knight is present. I do not suppose he wants to be elected himself.

MR. KNIGHT—That is right.

The motion to elect the Palmer Wire Company, of Palmer, Mass., an honorary member of the Association, was unanimously agreed to.

Mr. SABIN—The Sunset Telephone and Telegraph Company, of California, make application for honorary membership in this Association.

THE PRESIDENT—The application of the Sunset Telephone and Telegraph Company, of California, for honorary membership in this Association, is before the Association. Gentlemen, will you remark upon the question?

MR. FAY—I move that they be admitted.

The motion was agreed to, and the Sunset Telephone and Telegraph Company was admitted to honorary membership in the Association.

THE PRESIDENT—Is there anything further of this kind? If there is no further business, the Chair will begin the call of the committees. The first committee on the roll is the Standing Committee on Legislation, of which Mr. Eckert, of New York, is chairman. Their report is called for.

MR. DURANT—Before that report is read, I will ask whether it is customary to have those reports read in executive session, or not.

THE PRESIDENT—The Chair will state that this report on legislation has never been read in executive session, as it says nothing that we would not exhibit to all the world.

MR. DURANT—I had better explain. Mr. Glidden wrote me a short time ago and asked me to make a report on a bill in Ohio. I had already received a report from Mr. Beach, giving me the proposed law, and I wrote to Mr. Glidden, saying that I had received it from Mr. Beach, and asking him to notify him, as I thought it would not be proper for me to do so. Mr. Glidden has not replied to me. He thought it would not be proper to be reported on.

THE PRESIDENT—It is public property, is it not; a public bill?

MR. DURANT—Yes, sir; it is a public bill.

MR. PHILLIPS—Anybody can get a copy of it, if he wants to.

THE PRESIDENT—Of course it is for the Association to say whether this report shall be read in executive session or not. The Chair will say, practically, that nothing has been reported by the Committee on Legislation except that which was public matter, and that they have confined themselves to facts and to the giving of the local statutory condition of the business. I suppose that has been the object of the Committee this year.

MR. FAY—I move we hear these things in open session. Of course all matters of legislation are matters of open and notorious comment among the newspapers generally, and I think that the more they are ventilated the better it is for our business.

THE PRESIDENT—The motion is that the report of the Committee on Legislation be read in open session. Does any gentleman of the Association desire to remark upon the question? If not, the Chair will put the motion. All those in favor of having the report of the Committee on Legislation read in open session will signify their assent by saying aye. The contrary, no. There are no dissenting votes. It is unanimously agreed to, and the report of the Committee on Legislation will be read.

MR. STONE—Before Mr. Eckert reads his report on legislation, do I understand him to say legislation in Ohio?

MR. ECKERT—I referred to a bill that has been before the last Legislature.

MR. STONE—I take a great deal of pleasure in saying to the members of this Association that there has been no legislation adversely to the telephonic interest in the State of Ohio. There were bills introduced, but I am pleased to say that the legislators of our State are too good men to put any obstacles in the way of the telephone. They have too much good sense to do that. There was a bill introduced into the Legislature of Ohio, and it was acted upon in committee, but it was never returned to the House in which it originated. Hence we have no adverse legislation on the subject of the telephone in the State of Ohio.

THE PRESIDENT—Then you, certainly, are not afraid of the contents of the report?

MR. STONE—No, sir; I am not.

THE PRESIDENT—Then we will have the report read; but before doing that, I will appoint the Committee on Re-organization of Committees, called for by the resolution of Mr. H. L. Storke, which was adopted at the morning session. The Chair appoints on that Committee Mr. H. L. Storke, of New York; G. F. Durant, of St. Louis; C. N. Fay, of Chicago; Henry Metzger, of Pittsburg, and W. D. Sargent, of Brooklyn. The Convention will now listen to the report of the Committee on Legislation.

Mr. Eckert then read the report of the Committee on Legislation, as follows:

MR. PRESIDENT AND GENTLEMEN—Your Committee on Legislation, of which I have the honor to be Chairman, respectfully presents the following report, compiled from a large number of replies to inquiries addressed to the members of this Association.

The following is all that is reported as to State legislation affecting telephone interests had during the past year:

In New York State:

NEW YORK LAWS, 1884.

CHAP. 534.

An Act in relation to Telegraph and Electric Light Companies in cities of this State.

PASSED June 14, 1884.

SECTION 1. All telegraph, telephonic and electric light wires and cables used in any incorporated city of this State, having a population of five hundred thousand or over, shall hereafter be placed under the surface of the streets, lanes and avenues of said city.

SEC. 2. Every corporation, association or person owning or controlling telegraph, telephonic, electric or other wires and cables, including what is known as telegraph poles, and other appurtenances thereto, shall, before the first day of November, eighteen hundred and eighty-five, have the same removed from the surface of all streets or avenues in every such city of this State.

SEC. 3. In case the owners of the property above enumerated shall fail to comply with the provisions of this act within the time herein specified and limited, the "local governments" of the said cities of this State shall then, and they are hereby directed to, remove, without delay, all telegraph, electric light, and such other wires, cables and poles, wherever found above ground, within the corporate limits of their respective cities.

SEC. 4. No city in this State shall grant any exclusive privilege or franchise under this act to any corporation or individual by which a monopoly may be created or competition prevented on equal terms.

SEC. 5. This act shall take effect immediately.

The Legislature of Delaware, at its last session, failed to pass a proposed act taxing telegraph and telephone poles 10c. each per annum, but in enacting a new charter for the city of Wilmington authorized the city to regulate the erec-

tion of poles through the city, and empowered the Council to assess a tax on telegraph and telephone companies.

The Council placed the rate of one dollar per year on each telegraph and telephone pole in the limits of the city, which, I believe, has been paid by all companies doing business there.

The Legislature of New Jersey, at its session, passed an act levying a tax of 2 per cent. on the gross receipts of all telegraph and telephone companies doing business in the State. This dates from January 1, 1884.

In Tennessee—A privilege tax of 50 cents for each telephone station for both county and State has been levied by an act of the Legislature, making a tax of one dollar per subscriber.

In Ohio—A bill has been introduced in the State Legislature regulating the charges of telephone companies, without, however, any action having so far been taken on the bill. The proposed bill is as follows:

A BILL.

To regulate the charges of Telephone Companies.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That it shall be unlawful for any telephone company or companies under the laws of this State or any other State, and doing business in Ohio, to charge, demand or receive for the use or rent of any telephone from any public office or place of business, a greater rental for the use of telephones than as follows: For a single special wire, three dollars per month; for a wire used by two public offices or places of business, four dollars per month; for a wire used by three or more, five dollars per month; for private residences, two dollars per month.

SEC. 2. Any telephone company or companies doing business in this State which shall refuse to lease or permit to be used, or shall demand or receive from any public office, place of business or private residence for the rent and use of any such telephone, a greater sum than is provided for in section one of this act, or shall refuse to release said telephones on demand, shall be liable in an action of debt to the injured parties in a sum of not less than three hundred dollars nor more than five hundred dollars, recoverable in any court of competent jurisdiction in the city or county where such telephone company is located and doing business.

SEC. 3. This act shall take effect and be in force from and after its passage.

There has been considerable local legislation in various cities throughout the country, of which the following will be of interest:

[12,724.]

AN ORDINANCE prescribing the terms upon which telephone companies may erect and maintain telephone poles in the streets, alleys and public places in the city of St. Louis.

Be it ordained by the Municipal Assembly of the city of St. Louis, as follows:

SECTION 1. No person or persons, corporations or association doing a telephone business in the city of St. Louis, shall be entitled to the privilege of using the streets, alleys and public places of said city as provided in ordinance number 11,604, except upon the following conditions, to wit: That said person or persons, corporation or association now doing business, or any such that may hereafter begin such business, shall file in the office of the City Register within thirty days after the passage of this ordinance, or at the time that application is made, for the use of the streets or alleys under the provisions of ordinance number 11,604 his or its written acceptance of the privileges granted by ordinance number 11,604, and agree therein that he or it will, on the first days of July and January of each year thereafter, file with the Comptroller of the city a statement

of his or its gross receipts from his or its business arising from the telephone business for the six months next preceding such statement, which shall be sworn to by such person or persons or the President or Secretary of such corporation or association ; and further agree that he or it will, at the time of filing such statement with the Comptroller, pay into the City Treasury two and one-half per cent. on the amount of such gross receipts up to the year 1890, and five per cent. on the amount of such gross receipts thereafter ; which amount shall be in addition to all other taxes imposed by law, and such person or persons, corporation or association, shall at the time of filing such acceptance, also file with the City Register his or its penal bond in the sum of twenty thousand dollars, with two or more good and sufficient securities, to be approved by the Mayor and Council, conditioned that he or it will comply with all the provisions of ordinance 11,604 and of this ordinance and of all ordinances which may hereafter be passed relating to telephone companies, and will pay into the City Treasury the percentage upon its gross receipts as provided by this section.

SEC. 2. If the Comptroller shall not be satisfied of the correctness of any statement made as required in the preceding section he shall have power to require any of the parties making such statement to make to him an exhibit of the books and papers of such party, and he may make an examination thereof, and if it shall appear from such books and papers, or if in any other manner he shall have satisfactory proof thereof that the gross receipts of such party during the time specified in such statement were greater than the amount so returned in such statement, then the said party, notwithstanding such statement, shall pay into the City Treasury the percentage as provided in section one upon such excess.

SEC. 3. Any person or persons, corporation or association, doing a telephone business in the city of St. Louis, or any president, manager, superintendent or local officer in charge thereof, who shall violate or fail to comply with any of the provisions of this ordinance, shall be deemed guilty of a misdemeanor and, upon conviction thereof shall be fined not less than fifty dollars nor more than five hundred dollars, for each offence ; and each and every day's refusal or neglect to pay the amount due for any six months, as provided in the preceding section of this ordinance, within ten days after the same becomes due and payable, shall constitute a separate offence.

SEC. 4. The city of St. Louis reserves the right to alter, amend or repeal this ordinance at any time.

Approved March 15th, 1884.

An attempt is also being made in that city to compel the Telephone Company to allow other companies to use its poles and to fix rates therefor, in accordance with rules and regulations adopted by the Board of Public Improvements, as follows :

No permit shall hereafter be granted for the erection of poles unless the party making the application shall, in writing, agree :

1st. To erect poles of such dimensions as to admit of at least fifteen cross-bars of the usual size, at the ordinary distances, being placed thereon, except by special permission of the Board.

2d. That it will erect such poles within the time specified in the permit, such time not to exceed thirty days, and that the permit shall be null and void if the poles are not put up within the specified time.

3d. That it will grant to any other company requiring electric wires for its business, the right to use one or more cross-bars of its poles, at an annual rent of forty cents for a half cross-bar and sixty cents for a full cross-bar, except in cases where the party asking for room on another company's poles is itself charging that company a higher rent per cross-bar on its own poles heretofore erected, in which case an equal rental may be demanded for wires on poles erected under these rules.

4th. That it will not place any more wires or cables on its own poles, or on

the poles of other companies, than are actually necessary for its business, and that it will promptly remove any unused wires from the poles.

Adopted by the Board of Public Improvements, May 23d, 1884.

The Common Council of New Orleans has levied a tax of five dollars per year on each telephone pole in that city, and in addition demands ten free telephones for the use of the city. The matter is being contested by the Telephone Company.

The City of Camden, N. J., passed an ordinance levying a tax of 25 cents per pole per annum, but as the Telephone Company has an arrangement whereby it maintains the fire alarm, it has so far been inoperative in their case.

The Council of Chester, Pa., has levied a tax of one dollar per pole, but this has not been collected, and may be resisted.

The Town Council of West Chester, Pa., require free use of the exchange in consideration of the use made of the streets and alleys of the town for erection of poles. This will be satisfactorily arranged.

The Common Council of Omaha, Neb., after three months' agitation and investigation of the subject, passed an ordinance governing electric lights, requiring that they shall be placed, as far as possible, on the *opposite* side of any street or alley occupied by telephone or telegraph wires; that when necessary to cross the route of such telephone or telegraph wires, they shall cross at least five feet above or below, be *securely* fastened to supports as *near as practicable* to such telephone or telegraph wires, or be carried across such route in boxes. It provides they shall not be placed so as to interfere by contact or induction with telephone or telegraph wires. In case they are so placed, any officer of the telephone or telegraph companies, any person entitled to the use of any telegraph or telephone wire or instrument, endangered thereby, or any officer of the city government, may notify electric light company thereof in writing. If the interference is not remedied within twenty-four hours, the light company are subject to fine of not less than fifty dollars for each twenty-four hours the wires remain in such position.

The Sioux Falls (Dakota) authorities ordered the Telephone Company to remove its poles from the streets to alleys within ten days from the date of the issuance of the order, and I infer from the report of Mr. Temple, the General Superintendent of the Erie Telephone and Telegraph Company at that place, that the order was enforced. An injunction restraining the city authorities from interfering with the re-establishing of the exchange was obtained, and at the same time a suit instituted for ten thousand dollars damages against the city. This suit the city at present desires to compromise.

Mr. C. N. Fay, the General Manager of the Chicago Telephone Company, makes the following report, which will be of interest:

The underground ordinance passed by the city, under which all wires were to be laid underground by the 1st of May, 1883, was met last year by a preliminary injunction restraining the city from interfering with the wires. The city has not yet applied to the authorities to dissolve this injunction, simply because it has a very large overhead system of its own which it does not wish to disturb.

We are considerably annoyed and hampered in extending our business because

the police allow no new wires to be erected, and our stock of dead wires, prepared in anticipation of this difficulty before it became operative, is nearly exhausted, but as yet the executive officers of the city are unwilling to lay violent hands upon the telephone and telegraph system, although the Board of Aldermen has so directed.

In New York city the effect of the underground law has been to bring about two suits against the company ; the facts in regard to which I will give.

On the 28th of last June we were served with a notice by the Colwell Lead Co., a corporation which is in the possession, and claims the ownership of the lot of land on the northwest corner of 39th street and Sixth avenue, to remove two of our poles on 39th street within 48 hours, and stating that upon our failure to do so the said Colwell Lead Co. would take them down and remove them. We applied for and obtained from the Superior Court of this city a preliminary injunction against that company, and upon the return of the order issued by the Court, we moved that the injunction be continued, which motion was denied, on the ground that we could change the location of our poles "with but little trouble and at comparatively small cost," and that therefore we would not suffer any irreparable injury by the commission of the acts threatened.

At our request, the Court delayed the filing of the order which was required to give effect to this decision, and during the time thus given us, we again moved, on additional affidavits, to continue the injunction. On this latter motion the Court handed down its opinion denying the motion upon the ground that the Act of the Legislature under which the fee of the streets of this city was vested in the city having limited the use to which they could be put, viz: that they be appropriated and kept open as public streets ; and their use for the erection of poles to conduct telegraph and telephone wires not being, in the opinion of the Court, a *street use*, the Legislature had no power, so far as the rights of abutting owners are involved, to authorize this company to use the streets for such a purpose.

This suit was afterwards compromised by our company moving the two poles a few feet, but not off of what the Colwell Lead Company claimed to be their property, the understanding being that this arrangement gives us no tenure for the poles after November 1, 1885, that being the limit of the time given by the Legislature for the wires to go underground.

With the exception of a suit brought by Emma Fowler, owner of a lot on Park avenue, New York, to restrain us from erecting poles on that avenue, which suit is now pending, this Company has no other litigation bearing on this subject.

W. H. ECKERT, *Chairman.*

THE PRESIDENT--Gentlemen of the Association, you have heard the report. What action will you take upon it? It is moved that the report be accepted, ordered on file and printed in the minutes. Before that will be considered the sense of the Association, I would like to ask whether there are any members of the Association who can contribute to the fund of information upon this matter of legislation.

MR. FAY—I should like to say in regard to Chicago that since we submitted the statement which Mr. Eckert embodied in his report, the city authorities of Chicago have brought the validity of their ordinance to a test by causing suits to be brought against the Western Union Telegraph Company, the Baltimore and Ohio Railroad Company, and the other telegraph companies. It was the intention of the Alderman who brought these suits to include the telephone companies, but he overlooked it by accident, so that the suits were only brought against the telegraph companies for damages which the City of Chicago claims to recover from those companies. Those suits, or, perhaps, to speak more correctly, this suit, will come up at the fall term of our courts, and will give us some definite idea as to the validity and legality of that ordinance. I would like to ask Mr. Durant if he could not enlighten us as to the real history and animus of the attack that is made on the companies in St. Louis.

MR. DURANT—It arose, I think, from a little trouble we got into with the Brush Electric Light Company. I allowed them to run two of their wires on our poles. Our Board of Directors shortly afterwards took exception to my action in the matter and ordered the Electric Light Company to remove their wires from our poles.

Negotiations then were begun between the two companies looking to an amicable adjustment of the matter.

While these negotiations were pending, it was found that a city ordinance existed which prohibited the stringing of electric light wires above ground.

To remove this obstacle the Brush Electric Company endeavored to secure the repeal of that ordinance.

About this time the Thomson-Houston Company were endeavoring to secure some legislation, and another alleged Telephone Company was peddling stock around town. Some of the city officials were interested in the latter.

There was also some agitation of the underground question in the City Council.

We have a Board of Public Improvement, composed of the

heads of the different departments of the city. The members of this Board are educated civil engineers and above reproach. All ordinances affecting the streets, sewers, etc., are prepared by this Board for the City Council.

They took up the matter, evidently with a view of adopting some plan to afford any and every company such pole facilities as they might require. The rules and regulations embodied in the report of the Committee on Legislation were adopted by this Board, and are now in force.

Before the regulations were adopted the Board gave all the companies a hearing. Nearly every company in the city was represented, some advocating, others opposing the measure.

The only modification made, however, was to fix the price at 40 cts. per annum for half a cross-arm, or 60 cts. for a full arm, instead of 50 cts. per arm, per annum, as at first proposed.

We have not subscribed to the regulations, for obvious reasons.

MR. DRAKE—When this question came up, I did not apprehend the scope it would assume. But since I have heard the report read I have noticed quite a number of points mentioned in regard to adverse legislation, that it seems to me will have a direct bearing on our business, and I would like to ask if this report is to be published in any manner except in our regular form?

THE PRESIDENT—Not in a full manner. The public have no interest in our proceedings.

MR. DRAKE—Will it be published in any newspaper here?

THE PRESIDENT—Probably no more than as a reporter may have caught it as it was read.

MR. DRAKE—There is a tendency among the anti-monopoly people of the West to copy after the legislation of the East, and I notice that you have the adverse legislation of the municipal authorities, and some very pernicious movements, which will be held up as examples, and I think it will be better for our interests if all reference to that matter be dropped, so far as its publication is concerned.

MR. FAY—Just before this report was presented I offered a resolution which was voted on here that we have no secrecy about these matters. I think, with all due deference to the gentleman who has just spoken, that he is mistaken. The adverse legislation has generally commenced in the West and has worked East, and in every case the people have had no difficulty whatever in possessing themselves of all the necessary facts. There is no trouble, in other words, in allowing the people to find out everything that they want to know. I think it is a mistake for us to sneak and dodge behind trees to defend ourselves. I think that we are right in defending our acts. I think the Communistic, or Granger, or Dynamite interest, or whatever you call it, which prevails to-day, is a temporary thing, and will pass away, and in every case where I have known of adverse legislation, which was not prompted by corrupt motives on the part of the legislators, every single one has failed. In every instance which came to my notice I have no hesitation in saying that it was a direct, corrupt attack on the part of some particular member of the Board of Aldermen against telephone companies, and that they wished to control it by direct payment, which we declined to make. Therefore, I think it is a mistake to appear before the public as being afraid of hasty, unjust and invidious legislation.

MR. DRAKE—I think the gentleman misunderstands me. I do not propose to defend here any measure which would be unjust to the public; but I think it is just for us to defend ourselves, perhaps not by open opposition, but by withholding information to such as may be inclined to this adverse legislation and as to what other towns are doing. It is well enough for us to combat them when they come up; but why should we put a precedent in the hands of these legislators. That is the point I desire to make.

THE PRESIDENT—Gentlemen of the Association, you have heard the suggestion of the gentleman who has just spoken; will you take any action on it?

MR. STORKE—I agree with Mr. Fay entirely. What little information we communicate to each other here, is only a

drop in the bucket. These telephone exchanges are everywhere, and whenever any local feeling is aroused, it must be met openly. There is nothing in our business on which we are afraid to meet the public. Certainly, there is not in this matter of State or municipal interference. If ordinances are passed which would tend to deprive us of the proper methods of doing business, or practically tax us out of existence, that is a matter which will cure itself in each case. So far as the actual results are concerned, it has not interfered to any very material extent, and therefore I do not see why this report cannot be considered in open session.

THE PRESIDENT—Do you know of any Company that has been crippled in its business by legislation?

MR. STORKE—I do not know of any Company that has been crippled in its business, or compelled to stop on account of interference from legislation of any kind. We have all to face these matters to a greater or less extent, and it is a part of our business here to discuss them, and get suggestions as to the best way in which to meet them when they come up. Now, in the case of underground legislation in New York State, I would like to ask Mr. Sargent, for the information of the Association, what the practical result has been in Brooklyn, and what the feeling among the people and the municipal authorities has been so far. As I understand it, the practical result has been that there are more poles in Brooklyn to-day than ever before, and with the full consent of the authorities. That an examination of the question of the probable cost of putting the municipal wires underground, aside from the nuisance of tearing up the streets, reaches a figure which will be prohibitory, that the city government and the tax-payers stand opposed to the bill which was passed by the Legislature, and that the City Solicitor of Brooklyn has given it as his opinion that it is inoperative and cannot be enforced.

MR. SARGENT—The passage of the so-called Daly Underground Bill affected the cities of New York and Brooklyn only, and was championed by such demagogues as Mr. Daly, because, as he stated, the people were crying out against

telegraph and telephone poles. Now, Mr. Daly may be an apostle of the people, but Brooklyn is not Macedonia, and I can truthfully say that no such cry ever came from among them; on the contrary, we have been treated by the public and municipal authorities in a spirit that shows the cosmopolitan character of our city. We have to-day as fine a system of telephone pole lines as we could desire, and they were all erected by permission of the municipal authorities and without protest from the citizens. After the bill became a law, Mayor Low invited a conference of the Telephone, Telegraph and Electric Light Companies, and a very full and fair discussion was had in which we presented the difficulties of underground work, and our earnest desire to overcome them by any convenient and practical means, submitting that no coercive legislation could hasten the desired end, unless the city was prepared to do the work for us and guarantee it. The Mayor and his legal advisers were of the opinion that the bill was so very defective that it was doubtful if it could be enforced.

Later on the Mayor requested Superintendent Watson of the Brooklyn Fire Alarm Telegraph to prepare an estimate as to the probable cost of placing the Department's wires underground. He reported the probable cost as $322,000.

The municipal authorities are still granting us permits for such work as may be necessary and for the renewal of old poles.

MR. GIFFORD—What was your estimate for the whole telephonic system?

MR. SARGENT—That is a question which cannot be answered at once. In putting the city wires underground you would have to cover a large mileage of line with a limited number of wires, and the cost, therefore, would be great, per wire. But if the Telephone Company went underground with their wires, the cost per wire would be considerably less. How much I would not like to say.

MR. LOCKWOOD—I have no hesitation in saying that my opinion coincides with that of Messrs. Fay and Storke in

this matter. My experience has led me to believe that the more we have intelligent discussion upon this subject the more likely we are to repress injudicious legislation. If we can bring this subject in its true light before those who make our laws, I think they will be a great deal more likely to cease their efforts to retard us in our endeavors to advance. I do not propose to pose here, as I was characterized in one of the Sunday papers of this city, as a secret emissary of the American Bell Telephone Company to keep wires overhead; but I do not think any legislation will send us underground any quicker than we will get there ourselves. It is our interest, as soon as we can, to put our wires underground, and to get them there as soon as we find that we can do it with reasonable expense. The very fact that every attempt which has been made, so far, in order to repress us, has in no way hindered us, should encourage us to give everything we may know to our friends, in order that they and we may discuss them impartially and thoroughly here, and give every one who wishes to convey the information all over the country an opportunity to do so. In any case, I can thoroughly indorse all that Mr. Fay has said on the subject. Whatever can be said about it, cannot hurt us any more than we have been hurt.

MR. SABIN—I think we are moving away from the subject. I agree with Mr. Drake. It is all very well to say that the subject is well understood by the people, and that the mayors of the cities, and the city solicitors have this information, and that anybody who wants it can get it; but, as a matter of fact, they have not this information. St. Louis passed a law imposing a tax of two and a half per cent. upon telephone companies per year, for ten years, and five per cent. thereafter, and, all the way down, from the highest to the lowest, all these places are waiting for this information, and I say that if they get that information they will come down on us for it, and make us pay for it. It is all very well for us to say that we are not afraid to give the information, but I submit there is no reason why we should furnish the club with which to have our own brains knocked out.

MR. FAY—I do not know of any single case of adverse legislation which has not been published in the papers, and scattered, by means of the Associated Press, all over the country, and as far as anybody waiting to get information in the newspapers in order to get up a hostile bill against us is concerned, I think we will all agree that every man has ingenuity enough to get that up for himself. Every man thinks he can draw a bill to suit himself, and in reference to the attack upon the telephonic interests, beginning in the East and moving to the West, let me say that the Granger movement commenced in the West, and the anti-monopoly movement. It is not against us alone. It is against all corporations, and as we have nothing to fear from the utmost publicity in reference to our matters, the more light we have upon the subject, the better I think it will be for us. As I understand it, there are three points of opposition which we have to meet. The first is a regulation of the amount of construction; the second is, as to the rates to be charged for service; and the third is, as to the rates of taxation. Now, it would be for the benefit of the business throughout the country if the Association acted unanimously and endeavored to obtain uniform regulations in regard to all these things. In regard to the methods of construction take the underground plan. I think that the managers of all exchanges will say, "We are perfectly willing to go underground to the extent that common sense demands." We are perfectly willing to bury a large amount of our wires wherever it can be intelligently and honestly done. We are perfectly willing to go underground in Chicago; and I think Mr. Eckert will say the same thing for New York; but it is a question which requires care and consideration, and the mutual interests of all concerned should be carefully consulted.

With regard to rates, and to the assumption that the legislatures of the several States may attempt and endeavor to enforce the power to regulate rates, I think I may say that that attempt has not been made, for the principal reason that the rates are reasonable throughout the country,

and in a great portion of the country they are not higher than the people would make them, if they had the power of regulating that subject themselves. In fact, they are so satisfactory to the general public, that wherever we have thought it necessary to increase them, we have never had a conflict with our managers where our efforts have not been crowned with success.

In regard to taxation, the practice is as different as is the number of communities in which the taxes are levied. As far as we are concerned, I think I can safely say that the Companies are perfectly willing to recognize any system of taxation which is fair, and always have been, and are ready and willing to pay their taxes. Of course our reports are published in our own journals, and sent around to the members of our Association. They are noticed in the newspapers to some extent; but my observation has been that the subject has been too prolix for the reporters to give any general notice to us, and as far as my experience has gone, it is that the more public the information as to our doings, the better it is for us.

MR. HALL—I rise to a question of information. What is the question before the Association?

THE PRESIDENT—The Chair will take pleasure in giving the information. There is no question before the Association; but we are in the discussion of the report of the Committee on Legislation, which has usually been passed upon without any remarks. Strictly, in a parliamentary point of view, your conversation, gentlemen, has been of the most disorderly kind, but it is the usage of the country, and the Chair has allowed it to go on. At the risk of being disorderly myself, will you allow the Chair to say a word on the subject, which is simply this? We are all of us *quasi* public corporations. We are enjoying public franchises, and, as a corresponding side to that, we are burdened with public duties. Those public duties are, in the first place, the payment of our taxes. They are, in the next place, the use of our franchises directly under the grant that the legislatures or the municipal authorities make to us. Now, it is worth

while in conducting our business to keep those ideas very clearly in mind, without any attempt to dodge them, and for that reason I believe that no degree of publicity which is given to the attempt of the city or state legislation to restrain us, to tax us, to cripple us in any way, will be of any possible detriment to us. These questions will come up locally all through the country, and they will be met locally and by local influence, and, do what you may, it cannot be avoided. However, you may rest assured of this one fact, that the telephone business in any place, where it is of any value whatever, is never going to be killed by legislation. No business ever was killed in that way in this country, and no business of this size ever will be killed. It will not even be seriously crippled for a short time, because we are living in a business community, and it simply requires a presentation of the facts in relation to our business, to secure the countenance and co-operation of the people. If we are not making money under certain conditions, and cannot make money under those conditions, and it is necessary to remove those conditions, we have only to make that fact known to the community in which those conditions exist, and the community will support us in the change. That has been the experience of telephone men all the way through.

Will you discuss this matter further, gentlemen, or has any other member of the Association anything to present germane to the subject under consideration?

MR. LOCKWOOD—Since you have called for remarks on this subject, Mr. President, I would like to advert to a parallel case which came under my notice within the past year, which has demonstrated to my mind the advantages of publicity. I refer to the onslaught which was made in Congress in the former part of this year on the patent laws. From one to thirty bills were introduced into Congress, striking directly at the root of the patent business. One was to reduce the length of a patent from fourteen years to five; another was to hamper suits in infringement by providing that in no case should suits for over fifty dollars damages be gained; and also, that the prosecuting party should in any

case pay the cost of the prosecution and of the suit. There were some five or six bills to that effect alone, and a great many other bills, all more or less damaging to the patent interests of the country, were introduced and referred to committees, all being more or less canvassed in the House of Representatives and in the Senate of the United States. Some of them were Senate bills, and some were House bills, but not one of them was passed, and I think that this result was immediately due to the publicity given to the matter by the newspapers of the country. The chairman of the committee of the United States Senate to whom they were referred, was no less distinguished a man than Senator Platt, of Connecticut, who, in a most masterly speech, gave the gist of the patent law before Congress, and that killed the whole subject for the time being. The movement originated in the West. It was believed to have originated among the grangers of Minnesota, and it was supposed to be fostered by the railroad companies who desired to get the advantage of improvements secured by patents free of charge.

MR. FAY—That reminds me of something I heard from the Superintendent of the United Telephone Company, of England, when they were working under the restrictions imposed by the post office department. I do not remember what the restrictions were, but in a general way they were these: The Telephone Companies, in the first place, took the business and bought the patents. The Government then stepped in and said that under the Postal Telegraph Act they had a right to assume a monopoly of the telephone business, and after a long debate in Parliament a compromise was made by which the Government licensed the existing telephone company to go on doing business, subject to a royalty of ten per cent. The whole thing was, no doubt, a clean steal as far as the Government was concerned. They took the patent law, which was intended to benefit the inventors, and used that as a club with which to extort ten per cent. of the gross receipts of the telephone business. Then the Government prevented the transaction of long line business, that is, the connection of exchanges

over trunk wires. They licensed exchanges at five miles radius, but all business beyond that was monopolized and reserved by the British government. Again, they reserved the right of carrying on telephone exchanges in all the towns in which existing companies were licensed, and they tried to enforce upon the companies the very obnoxious provision, that the Government should command an unlimited number of telephones of the parent company at a purchase price which permanently extinguished the royalty. I may be mistaken about that, but I think the Government reserved the right to license competing companies, these competing companies being authorized to require the telephone companies which occupied the tract to furnish them telephones with which to exercise their competition. It was a very unjust thing all around, and finally the postal department showed a determination to enter actively into the telephone business and began the building of exchanges. Well, it hurt the telepone companies, and so limited the business, particularly the latter, that it could not be developed. Capitalists would not pay up the necessary money to build telephone exchanges. People would not subscribe to the Government lines, because they never got service when they did, and the result is that the subject has been agitated in Parliament within the last two months, and the pressure of public opinion was so great that Parliament has increased the radius of telephone lines from five miles to fifteen, according to my present recollection. I am stating this very loosely, and without any reliable data at hand, and it may be that I am in error as to some of these statements of fact, but the Government has licensed the telephone company to use the postal trunk lines for the purposes of its exchanges, and they have abolished the obnoxious requirement to furnish any number of telephones to competing companies for the purposes of competition, and the result has been that the business has been once more put on a safe and prosperous basis, and that there is every prospect of a safe growth in the telephonic business in Great Britain.

I think Mr. Berthon, the representative of the telephonic

interests in Paris, France, has recently gone through an experience of that kind in reference to the renewal of the license taken under the French system, and I would like to hear from him on that subject.

MR. BERTHON—It will afford me the greatest pleasure to give any information which I may possess to so distinguished and courteous an Association as this, and I cannot express my gratification at being permitted to join in your deliberations, but I must claim your indulgence if I do not express myself well in English. We have just renewed our contract with the Government for five years. They did not think that the telephone business had arrived to such a point that it should be of public interest to buy it up, and to run it as the telegraph service, under their exclusive control, otherwise they would not have been willing to renew the concession. A course of five years more may probably bring the telephone business more to perfection. The Government will see then what they have to do with it. If any of the gentlemen who are present desire to question me on any subject, I shall be glad to be of service to the Association.

MR. STORKE—I would like to ask you what proportion of your wires are underground, and what overhead?

MR. BERTHON—There are none overhead, except short lines. In streets where there are no sewers we reach the subscriber by running wires on short poles on the roofs of houses. Since the 1st January, 1884, we have entirely suppressed the ground circuits; the double wire system or metallic circuit has been put in full operation in Paris, and this has improved considerably the service. There are twelve central offices in Paris. The number of trunk lines is about two hundred and fifty. We have also put in use since several months a new system of calling subscribers (the direct call), enabling to leave subscribers connected in a permanent way, if asked so, and giving them the possibility of calling the party, to which they are permanently connected without dropping any of the annunciators in the central offices, and also of calling up, at will, the central office to get connections with other subscribers. This system does away with some

part of the operator's work in the central offices, and is profitable to us, as we charge an extra fare to subscribers to furnish them instruments with double-calling key, and for the permanent use of trunk lines which are rented when permanent connection is given through two central offices. Subscribers on direct call are becoming from day to day more numerous, as this system gives them, besides other advantages, the benefit of private line connection.

MR. FAY—You say that you have renewed your concession for five years more. As I understand it, that gives you a monopoly of the business, does it not?

MR. BERTHON—It does not give us a monopoly. The Government reserves the right to grant concessions to others, but I do not think any will be given.

MR. FAY—Then after the expiration of your franchise, your concession, the Government has the right to purchase the plant and the business, and you expect that they will do that, do you not?

MR. BERTHON—We expect they will do that, certainly

MR. FAY—Then it will be a clear monopoly all through?

MR. BERTHON—Certainly it will.

MR. FAY—And you pay a royalty at present?

MR. BERTHON—We pay more than twenty per cent. of the gross receipts of the exchanges, twelve dollars to the Government and sixteen to the municipality on each subscriber. These sixteen dollars are for the use of the sewers. The laying of the cables in the sewers is not done by us. It is done by the Government's telegraph office, which charges us for the expenses.

MR. FAY—But your royalty amounts to sixteen dollars per mile?

MR. BERTHON—Yes, sir.

MR DURANT—Do I understand the gentleman to say that at the end of five years of concession the Government can acquire the use of the wires by purchase?

MR. BERTHON—Yes, sir.

MR. FAY—I would like to ask Mr. Berthon what the condition of the patents is in France?

MR. BERTHON—The condition of the patents is that we have a license under Edison's patents, and we claim that his patents control all carbon transmitters. We have met with many infringements, and several lawsuits are now pending on carbon transmitters; but the Bell receiver has become public property in France.

MR. FAY—Suppose the Government should buy your plant, would you make it pay a royalty on the use of the telephone?

MR. BERTHON—The Government would not pay any royalty on the patents. It would pay for the instruments and lines, but we would expect the Government would treat the value of our patents fairly.

THE PRESIDENT—Are there any other questions that any gentleman of the Association desires to ask Mr. Berthon, in connection with the report of the Committee on Legislation? I will suggest that there are other questions which may be asked him which will be very germane in connection with the following report—the report on Central Office System and Exchange Statistics—he having a number of plans here, which he has kindly expressed his willingness to place at the disposal of the Association, so I will ask you to confine your questions to subjects germane to Mr. Eckert's report; that is, the relations of his Company to the Government.

MR. DURANT—Before we get off this subject, I want to correct an impression which seems to prevail; that is, that I was opposed to the publication of the report of the Committee on Legislation. I am not opposed to that publication, and I do not wish to be misunderstood in reference to that matter.

THE PRESIDENT—If there is nothing else to be remarked by any member of the Association, we will proceed to the consideration of the next report, which is the report of the Committee on Central Office System and Exchange Statistics, of which Mr. Sargent, of Brooklyn, is Chairman.

MR. FAY—Before that is called for, I would ask for a report from the Committee appointed this morning on the

place of our next meeting and the hours of our session. It will be remembered that last year, at Cincinnati, Governor Howard, representing the Providence Telephone Company, extended an invitation to the Association to meet at Providence this year, and it was accepted. Subsequently, upon the announcement of the Electrical Exposition which is now being held here, Mr. Vail, of the American Bell Telephone Company, and Mr. Tyler, President of the Association, wrote to me, stating that the meeting would be held here to better advantage, because everyone of us would naturally wish to see the Exposition, and we could combine a visit to it with the sessions of the Association, and therefore we had better hold this meeting in Philadelphia. As we had already accepted the invitation of the Providence Telephone Company, I wrote to them asking them whether they would waive their invitation for this year. They wrote back, very cordially waiving their invitation for this year, and extending it for next year, and thereupon I sent a circular letter to the members of the Association, in reference to the change of the place of holding this meeting, which was approved. Therefore, the meeting was held here, but we are still under our debt of courtesy to the Providence Telephone Company. It has been our practice to meet one year in the West, and then a year in the East, and I offer this explanation for the change, recommending the city of Providence as the place of our next meeting, instead of some Western city. The date of the meeting we recommend is the second Tuesday of September, which will be about the 12th. As to the hours of session, we recommend that the Association sit to-day and to-morrow, the morning session to be from ten to one, and the afternoon session from half-past two to five. It is probable that by to-morrow afternoon our business will be transacted, and we can adjourn *sine die*.

THE PRESIDENT—Gentlemen, you hear the report of the Committee. What will you do with it? A motion to accept the report and make it the action of the Convention will be in order. Do I hear such a motion?

MR. DURANT—As a member of the Committee, I agreed

to that report; but with the understanding that the next meeting of the Association after the meeting at Providence should be at St. Louis. I think St. Louis is entitled to the meeting, and would have been this year by the common law of the Convention, had it not been for Mr. Fay's suggestion of courtesy on our part toward the city of Providence.

THE PRESIDENT—It is understood that if this report is accepted, it is accepted with the understanding that we are mortgaged for 1886 for St. Louis. Do I hear a motion to accept this report?

MR. FAY—I move to accept the report without the mortgage. I think the mortgage is unconstitutional.

THE PRESIDENT—I think the mortgage should be left for the consideration of the lawyers of the Association. Gentlemen, are you ready for the question that the Association will meet in Providence, Rhode Island, on the second Tuesday of September next, and that the sessions of this meeting will be from 10 A. M. to 1 P. M., and from half-past two to five o'clock P. M. All those in favor of the motion will signify their assent by saying aye. It is a vote, and it is so ordered. The report of the Committee is adopted.

The Chair has already announced the Committee authorized this morning on the subject of the Re-organization of Committees. That Committee is expected to report at this meeting, before our final adjournment. If there is nothing else of an incidental character to be brought up, I will call upon Mr. Sargent to read the report of the Committee on Central Office System and Exchange Statistics.

MR. SABIN—I do not want to go upon the record as having it appear that California and Nebraska want to evade their taxation. We want to pay our taxes, and do pay our taxes. If the newspapers get hold of this two and a half or five per cent. tax, and a law is passed that we have to pay it, we will not oppose it; one gentleman said it is not a question of their going to ruin us. I do not claim that they are; but I do claim that when we pay our just taxes we should not put it in the newspapers and send it to our people, and say: "In such and such a place, the people

imposed such a tax on us, and the tax is right, and we submitted to it." There is no reason why the telephone companies, because they pay a tax in one place should pay the same tax in every other place.

THE PRESIDENT—I would suggest to Mr. Sabin that there is something wrong with his relations with the San Francisco newspapers, if anything of that kind should get in them. His remarks, however, will be noted; and his declaration of his willingness to pay taxes will not be charged against him. Will you hear Mr. Sargent's report from the Committee on Central Office System and Exchange Statistics?

Mr. Sargent then read the report of the Committee on Central Office System and Exchange Statistics, as follows:

MR. PRESIDENT AND GENTLEMEN:—For the second time we appear before you with a report that is dry, but not "extra dry." It was said of an eminent orator that he could move an audience to tears by the pronunciation of the word "Mesopotamia;" while we can scarcely claim so much personal magnetism, we think we can see various channels in which we can be useful, and, as we have spent all the money authorized by your liberal and intelligent body, we cannot be called deadheads in the enterprise. We find, in looking back over the previous reports of this Committee as well as others, they usually begin in an apologetic strain; we shall not do so, but will attempt "a little scold." Out of 150,000 subscribers our reports cover but 50,000, one-third of the whole number. Some of these reports are incomplete and unavailable. The New England Telephone Company, with 18,000 subscribers, including the city of Boston, sends in no report; the Connecticut Telephone Company, of which our popular President is a member, sends in no report; neither of them have sent any excuses. The opportunity is now offered to hear from them both. Others have sent excuses with more or less (principally less) merit. Unless something can be done to remedy this state of affairs, we fear to be summoned shortly on a Coroner's jury, and our verdict will be "Marasmus," and the epitaph:

> "A tender bud that tried to blossom in the snow,
> Lies withered where the violets blow."

And what a "cold day" that would be for this Association!

But let us proceed to a dissection of the reports as they stand. They include 211 offices, representing a population of 7,100,000, and the number of subscribers 49,782—ratio of subscribers to population 142. We should estimate the number of subscribers in this country at 150,000; therefore, we have reports from 32⅓ per cent. of the whole business.

Considering the interesting character of this work and its value, particularly for purposes of comparison from year to year, it is deplorable that we are not able to get fuller reports. We have prepared the following condensed tables, giving the various items that we are able to compare, one year with another.

Table No. 1 will be the number of subscribers; and we would say right here that in the population we have taken the Census Report of 1880 as a uniform basis.

Number of Subscribers.

No. 1. Cities.	Census, 1880. Population.	Ratio.	Sub-scribers 1884.	Sub-scribers 1883.	Sub-scribers 1882.	Sub-scribers 1881.
Population over 150,000.						
Baltimore, Md.	332,313	229.2	1,450	1,220	1,017	926
Brooklyn, N. Y.	566,663	307.	1,846	1,601	801	108
Buffalo, N. Y.	155,134	109.2	1,420	1,208	1,047	990
Chicago, Ill	503,185	155.	3,246	2,903	2,596	3,054
Cincinnati, O.	255,139	114.	2,238	2,099	2,056	1,741
Cleveland, O	160,146	99.	1,617	1,507	.....	.....
New York, N. Y. { Law...			598	582	578	
New York, N. Y. { Metro..	1,206,299	250.9	4,210	3,576	2,873	2,747
Philadelphia, Pa	847,170	385.	2,199	2,013	.....	.....
St. Louis, Mo.	350,518	257.4	1,362	.....	.....	.....
Population, 50,000 to 150,000.						
Albany, N. Y.	90,758	79.5	1,142	1,076	1,100	1,058
Detroit, Mich.	116,340	68.4	1,700	1,474	.....	.....
Jersey City, N. J.	120,722	308.7	391	346	.....	.....
Milwaukee, Wis.	115,587	99.3	1,165	960	.....	.....
Paterson, N. J.	51,031	92.6	551	473	.....	.....
Providence, R. I	104,857	55.1	1,892	1,745	.....	.....
Richmond, Va.	63,300	181.7	354	347	.....	.....
Rochester, N. Y.	89,366	123.4	724	607	549	.....
Washington, D. C.	144,293	165.5	872	.....	.....	.....
Population, 10,000 to 50,000.						
Atlanta, Ga	37,409	88.4	423	261	.....	.....
Charleston, S. C.	49,984	135.4	369	340	.....	.....
Covington, Ky.	29,720	192.3	154	148	.....	.....
Cumberland, Md.	10,693	77.5	138	135	.....	.....
Denver, Col	35,629	49.3	723	680	620	.....
Elizabeth, N. J.	28,229	340.1	83	70	.....	.....
Evansville, Ind.	29,280	51.5	568	550	440	320
Hamilton, O.	12,122	129.	94	79	82	.....
Hoboken, N. J	30,979	231.2	134	119	.....	.....
Macon, Ga	12,749	85.	150	113	.....	.....
Memphis, Tenn.	33,592	48.5	695	476	.....	.....
Nashville, Tenn	43,350	45.6	950	771	.....	.....
New Brunswick, N. J.	17,166	142.	121	101	.....	.....
Norfolk, Va.	21,966	90.4	243	192	.....	.....
Orange, N. J.	13,207	61.7	214	174	.....	.....
Pawtaucket, R. I.	19,030	63 2	301	319	.....	.....
Savannah, Ga.	30,709	114.5	269	250	.....	.....
Woonsocket, R I.	16,050	90.1	178	145	.....	.....

NUMBER OF SUBSCRIBERS—*Continued.*

No. 1. Cities.	Census, 1880. Population.	Ratio.	Subscribers 1884.	Subscribers 1883.	Subscribers 1882.	Subscribers 1881.
POPULATION UNDER 10,000.						
Asbury Park, N. J.	2,800	37.8	74	113		
Babylon, N. Y.	1,800	66.3	27	16		
Bloomfield, N. J.	5,748	106.4	54	54		
Boonville, Ind.	1,486	74.3	20	19		
Bristol, R. I.	6,028	125.6	48	41		
Carmel, Ill.	2,512	130.6	20	20		
Columbia, Tenn.	3,400	47.9	71	54		
Dover, N. J.	2,958	89.6	33	32		
East Greenwich, R. I.	2,887	67.1	43	27		
East New York, N. Y.	3,500	140.	25	17		
Far Rockaway, N. Y.	2,000	250.	8	11		
Flushing, N. Y.	6,683	99.7	17	63		
Frederick City, Md.	8,659	43.3	200	75		
Gallatin, Tenn.	1,938	71 8	27	9		
Hackensack, N. J.	4,248	121.4	35	33		
Hagerstown, Md.	6,627	69.	96	60		
Henderson, Ky.	5,365	101.	53	48	60	
Jackson, Tenn.	5,377	56.	96	75		
Jacksonville, Fla	7,650	62.	125	69		
Lawrenceburgh, Ind.	4,668	119.7	39	44	34	
Long Branch, N. J.	3,833	87.1	44	28		
Madison, N. J.	1,662	119.	14	12		
Morristown, N. J.	5,418	71.3	76	79		
Mount Vernon, Ind.	3,730	178.	21	26	45	
Murfreesboro, Tenn.	3,800	74.5	51	32		
Owensboro, Ky.	6,231	58.2	107	109	120	
Passaic, N. J.	6,532	85.1	75	74		
Plainfield, N. J.	8,125	80.4	101	100		
Rahway, N. J.	6,455	239.	27	13		
Union City, Tenn.	3,734	55.7	67	17		
Warren, R. I.	4,007	117.8	34	31		

Then follows a list where the population is from 10,000 to 50,000, very few of which we can compare one with another. I think these will be more interesting printed in the report than for me to read here.

In the fourth class of subscribers Asbury Park, N. J., shows a loss of 39, which is due to the rule of the Company for the payment of season contracts in advance. Far Rockaway, L. I., shows a loss of three for the same reason. Lawrenceburgh, Ind., Morristown, N. J., Owensboro, Ky., and Mt. Vernon, Ind., show a slight loss.

I mention these offices as the only offices that have shown a decrease in the number of subscribers. All the other offices show an increase. The figures are presumably of the first of August.

New York city has gained the largest number of subscribers since the last report, 634; Chicago has gained 343; Brooklyn, 245; Baltimore, 230; Buffalo, 212; Milwaukee, 205; Philadelphia, 186; Cincinnati, 139; Cleveland, 110, and the remainder of the cities show a gain of smaller numbers.

CITIES OVER 150,000.

Of 15 Exchanges, 9 Reported.

Exchanges.	No. of Offices.	Population, (Census 1880.)	No. of Subscribers, (Stations.)	Ratio.	Average of Connections Daily. Local. 24 Hours.	Local. 8 A.M. to 6 P.M.	Local. Highest in one hour.	Trunk. 24 hours to other Offices.	Trunk. 8 A.M. to 6 P.M. to other Offices.	Trunk. Highest in 1 hour to other offices.	No. of Employees in each Exchange. Day Operators, 8 A.M. to 6 P.M. Sub'r.	Day Operators. Trunk	Night Operators.	Other Employees, including Manager.	Total Employees in each Exchange.
New York, N. Y.	9	1,206,299	Met. 4,210	250.9	6,377	6,103		15,202	14,812		60	84	9	43	196
	3		Law, 598			2,263			2,070		7	2		2	11
Chicago, Ill.	9	503,185	3,246	155.	9,456	8,307	1,564	17,645	16,928	3,919	41	52	15	22	130
Cincinnati, O.	8	255,139	2,238	114.							66		9	8	93
Philadelphia, Pa.	7	847,170	2,199	385.2	8,376	8,180	829		386		38	20	9	7	74
Brooklyn, N. Y.	3	566,663	1,846	307.	3,783	3,064	428	1,72[illegible]	1,717	208	21	6	5	9	41
Cleveland, O	4	160,146	1,617	99.	5,466	4,922	654	5,303	4,685	661	43	6	5		54
Baltimore, Md.	1	332,313	1,450	229.2							17		3	6	26
Buffalo, N. Y.	2	155,134	1,420	109.2	4,250	3,655	530	1,230	990	150	20	1	7	7	35
St. Louis, Mo.	6	350,518	1,362	257.4							24	2	7	11	44
	52	4,376,567	20,186												

Exchanges.	No. of Operators required to manage office at most busy time.	Daily average No. of Calls per Subscriber. (Station)	Average No. Subscribers per Operator. (Day force only.)	Average No. Connections per Operator (8 A.M. to 6 P.M.)	Average No. Wires per Operator.	Weekly Pay of Operators, including Chief Operator. High'st	Lowest	Avr'ge.	Average Daily Pay Roll of each Exchange, including Manager (26 days per month).	Average cost of each connection (Exchange Pay Roll only.)	No. of Wires. Subscribers. Direct.	Subscribers. Circ'ts.	Trunk lines.	Extra territorial lines	Average daily No. connections on each Trunk Line. Sent.	Rec'd.
New York, N. Y.	156	5.1	29.2	145.	33.	10.00	2.50	6.10	222.09	.0066	4,204	2	491		31.	31.
	9	7.2	66.4	481.	67.	12.00	6.00	8.33	16.02	.002	598		106		19.	27.
Chicago, Ill.	111	8.4	34.9	271.	37.	8.00	3.30	6.30	147.25	.0054	3,246		254		35.	40.
Cincinnati, O.	66	9.6	33.9		32.8	13.84	3.46	6.54			1,750	220	179	20	7.	8.
Philadelphia, Pa.	70	8.	37.9	147.6	31.	16.25	4.03	6.09	96.08		1,580	173	49	7	50.	57.
Brooklyn, N. Y.	27	3.	68.3	177.	61.	9.23	3.00	6.09	43.77	.008	1,403	148	32	72	10.7	11.9
Cleveland, O	49	6.6	33.	175.	33.1	14.00	3.50	4.34	12.89	.005	1,550	32	29	11	75.	76.
Baltimore, Md.	17	6.8	85.3			9.45	5.00	6.45		.004	855	221				
Buffalo, N. Y.	21	4.	67.6	221.	57.	10.00	3.75	6.50	27.50	.006	1,005	157	32	5	39.	
St. Louis, Mo.	23		52.4		55.	17.31	3.46	6.30			1,314	14	103			

Exchanges.	What is busiest hour of day.	Average No. of Uncompleted Connections per day.	No. of Toll or Public Stations.	Average Cost of connecting each new Subscriber.	Average daily No. of Toll Connections.	Average Daily No. of troubles. Line.	Inst.	Average time consumed removing trouble. Line.	Instrument.	No. of Men Employed on troubles. Line.	Inst.	Total Time consumed making Ten Consecutive Connections from first call to last disconnection. Through One Office.	Through Two Offices.	Through Three Offices.
New York, N. Y.		1,789	38		2406	83	49	1 h. 22 m		2	3			
						10	5	55 m.		4	4			
Chicago, Ill.	10 to 11	1,355	65		218	52	27½	6 h.	4 h.	1	5	7 m. 5 s.	11 m. 38s.	
Cincinnati, O.	11 to 12		46											
Philadelphia, Pa.	10 to 11				25	73	35	30 m.	20 m.	20	9			
Brooklyn, N. Y.	9 to 10	634	25		709	50	20	1 h. 40 m.	1 h. 35m.	7	5	7 m. 15 s.	10 m. 6s.	
Cleveland, O	10 to 11		33		36					3	4			
Baltimore, Md.	9 to 10	800	52		126	18	13	2 h. 43 m.	2 h. 20m.	3	4			
Buffalo, N. Y.	9 to 10	520				13	11	1 h. 30 m.	1 h.	2	1	6 m.	8 m. 15s.	
St. Louis, Mo.	10 to 11					18	23			6	4	3 m.	7 m.	9 m. 30 s.

50,000 TO 150,000.

Of 22 Exchanges, 9 Reported.

Exchanges.	No. of Offices.	Population, (Census 1880.)	No. of Subscribers, (Stations.)	Ratio.	Local. 24 Hours.	Local. 8 A.M. to 6 P.M.	Local. Highest in one hour.	Trunk. 24 hours to other Offices.	Trunk. 8 A.M. to 6 P.M. to other Offices.	Trunk. Highest in 1 hour to other offices.	Day Operators. Sub'r.	Day Operators. Trunk	Night Operators.	Other Employees, including Manager.	Total Employees in each Exchange.
Albany, N. Y.	1	90,758	1,142	79.5	4,659	4,009	1,143	3,599	3063	683	18		3	15	38
Detroit, Mich	1	116,340	1,700	68.4							29	2	13	3	47
Jersey City, N J.	1	120,722	391	308.7	791	698	113	279	260	38	5	2	1	2	10
Milwaukee, Wis	1	115,587	1,165	99.3							13		5	10	33
Paterson, N. J.	1	51,031	551	92.6	1,725	1,550	210	80	75	15	9	2	1		12
Providence, R. I	1	104,857	1,892	55.4							25	4	1	2	32
Richmond, Va.	1	63,300	354	178 8	3,013	2,558	267				4		1		5
Rochester, N. Y	1	89,366	724	123.4	2,320	2,297	358				9	2	2	3	16
Washington, D. C	9	144,293	872	165.2	2,782	2,412	308	104	103	19	11		1	10	22
	17	896,254	8,791												

Exchanges.	No. of Operators required to manage office at most busy time.	Daily average No. of Calls per Subscriber. (Station)	Average No. Subscribers per Operator. (Day force only.)	Average No. Connections per Operator (8 A.M. to 6 P.M.)	Average No. Wires per Operator.	Weekly Pay: High'st	Lowest	Avr'ge.	Average Daily Pay Roll of each Exchange.	Average cost of each connection.	Subscribers. Direct.	Subscribers. Circ'ts.	Trunk lines.	Extra territorial lines	Sent.	Rec'd.
Albany, N. Y.	18	7.2	63.4	392.9	57.5	11.90	3.50	7.56	75.00	.0065	918	67	30	20	72	
Detroit, Mich	31	8.	54.8		48.6	16.25	3.75				1,405	87	18	18	8	5
Jersey City, N J.	7	2.7	55.9	137.	49.8	6.94	3.94	5.44	7.66	.0071	133	154	6	56	47	46
Milwaukee, Wis	18	3.4	64.7		54.	15.00	4.00	5.30	41.61	.0113	867	98		8		
Paterson, N. J.	11	3.3	50.9	147.7	42.	7.50	2.50	5.00	9.23	.0051	321	141		1	6	5
Providence, R. I	29	5.	65.2		28.6						270	520	42			
Richmond, Va.	4	8.8	83.5	639.5	86.						337	7				
Rochester, N. Y	9	3.2	65.8	202.6	40.	12.50	3.75	6.30	12.70	.0055	307	133				
Washington, D. C	11	3 2	79.2	228.6	48.	15.00	3.00	6.50	22.16	.005	308	169	12		104	122

Exchanges.	What is busiest hour of day.	Average No. of Uncompleted Connections per day.	No. of Toll or Public Stations.	Average Cost of connecting each new Subscriber.	Average daily No. of Toll Connections.	Troubles. Line.	Inst.	Time removing trouble. Line.	Instrument.	Men. Line.	Inst.	Through One Office.	Through Two Offices.	Through Three Offices.
Albany, N. Y.	10 to 11		10	11.65		21	17	30 m.	35 m.	1	1	8 m.	12 m.	18 m.
Detroit, Mich	10 to 11		32		350	14	16	45 m.	30 m.	5	5	9 m.	14 m.	
Jersey City, N J.	9 to 10	12	4		275	5	3	1 h 40 m.	2 h. 30 m.	2	2			
Milwaukee, Wis	9 to 10		9	27.00	155	14	13	½ h.	½ h.	3	4	4 m. 15 s.		
Paterson, N. J.	9 to 10		1		154	7	10	15 m.	15 m.	1	1	20 m.	30 m.	40 m.
Providence, R. I	10 to 11					4	16			2	3	7 m. 50 s.	12 m.	
Richmond, Va.	Varies.					5	4⅓					4 m. 25 s.		
Rochester, N. Y	10 to 11	152				8	9	1 h. 30 m.	1 h.	1	2	6 m.		
Washington, D. C	10 to 11	602	42			9	8	2 h.	22 m.	3	1			

10,000 TO 50,000.

Of 211 Exchanges, 50 Reported.

Exchanges.	No. of Offices.	Population, (Census 1880.)	No. of Subscribers, (Stations.)	Ratio.	Local. 24 Hours.	Local. 8 A.M. to 6 P.M.	Local. Highest in one hour.	Trunk. 24 hours to other Offices.	Trunk. 8 A.M. to 6 P.M. to other Offices.	Trunk. Highest in 1 hour to other offices.	Day Operators. Sub'r.	Day Operators. Trunk	Night Operators.	Other Employees, including Manager.	Total Employees in each Exchange.
Alexandria, Va.	1	13,659	103	133.	912	781	142				1		1		2
Allentown, Pa.	1	18,063	201	89.8	956	860	126	11	8	7	2		1	1	4
Altoona, Pa.	1	19,710	93	212.							2			1	3
Atlanta, Ga.	1	37,409	423	88.4	4,421	4,086	985				4		1		5
Attleboro, Mass.	1	11,111	70	158.7											
Aurora, Ill.	1	11,873	66	179.9	110	100	16				1			1	2
Belleville, Ill.	1	10.683	95	112.4							2		1	1	4
Binghamton, N. Y.	1	17,317	247	70.1	2,089	1,620	203	18	16	5	3		1	3	7
Camden, N. J.	1	41.659	185	225.2							2	1	1	8	12
Charleston, S. C.	1	49,984	369	135.4	3,615	3,356	735				3		1	1	4
Chattanooga, Tenn.	1	12.892	184	70.1	1,603	1,222	314								
Chester, Pa	1	14 997	143	104.2							1	1	1	3	6
Council Bluffs, Ia.	1	18.063	106	170.4							2		1	1	4
Covington, Ky	1	29.720	154	192.3							4		1	2	7
Cumberland, Md.	1	10,693	138	77.5	389	303	53	49	31	9	1		1	3	5
Denver, Col.	1	35,629	723	49.3	5,298	5,050	700				14		1	6	21
Easton, Pa	1	11,924	240	49.7	614	511	89	6	4	4	2		1	1	4
Elizabeth, N. J	1	28,229	83	340.1	199	170	26	10	10	2	1		1	1	3
Elmira, N. Y	1	20,541	352	58.3	1,986	1,694	230	19	17	5	6	1	1	5	13
Erie, Pa	1	27,737	275	142.							3		1	4	8
Evansville, Ind	1	29,280	568	51.5											
Hamilton, O.	1	12,122	94	129.							1		1	2	4
Harrisburg, Pa.	1	30,762	211	145.8	1,100	1,025	175	50	35	12	3		1		4
Hoboken, N. J	1	30,979	134	231.2	373	303	44	157	140	19	2		1	2	5
Joliet, Ill	1	11,657	173	67.3	639	528	61				1			2	3
Lancaster, Pa.	1	25,769	208	123.9	950	900	140	14	5	4	3		1	1	5
Lincoln, Neb	1	13,003	278	47.	1,617	1,244	210				5		1	3	9
Macon, Ga	1	12,749	150	85.	1,062	944	122				1		1		2
Memphis, Tenn	1	33,592	695	48.3											
Nashville, Tenn.	1	43,350	950	45 6	9,025						9		2	3	14
New Brunswick, N. J.	1	17,166	121	142.	275	195	36	4	3	3	1		1	1	3
Norfolk, Va	1	21,966	243	90.4	1,939	1,716	356				2		1		3
Norristown, Pa.	1	13,063	60								1			2	3
Omaha, Neb	1	30,518	535	57.	2,711	2,481	313				8	1	1	6	16
Orange, N. J	1	13,207	214	61.7	500	400	75	65	50	15	4		1	3	8
Pawtucket, R. I	1	19,030	301	63.2											
Pottsville, Pa.	1	13,253	195	68.	645	550	95	13	11	2	5			2	7
Pueblo, Col.	1	10,000	125	80.	800	700	100				2		1	3	6
Quincy, Ill	1	27,268	375	72.7	4,100	3,700	335	48	35	8					
Reading, Pa	1	43,278	525	83.4	2,330	2,121	345	21	17	4	9		1	1	11
Savannah, Ga.	1	30,709	269	114.5											
Schenectady, N. Y.	1	13,655	114	119.8	798	658	98	23	21	7	2		1		3
Scranton, Pa	1	45,850	466	98.4	1,724						6		1	4	11
Springfield. Ill.	1	19,743	571	34.6	6,400	5,000	750	200	160	25					
Trenton, N J.	1	29,910	264	113.3							2	1	1	3	7
Wilkes-Barre, Pa	1	23,339	352	66 3							4		1	5	10
Williamsport, Pa	1	18.934	331	57.2	1,291						5		1	3	9
Wilmington, Del.	1	42,478	320	132.7							4	1	1	4	10
Woonsocket, R. I	1	16,050	178	90.1											
York, Pa	1	13,910	108	129.											
	50	1,148,513	13,378												

Exchanges.	No. of Operators required to manage office at most busy time.	Daily average No. of Calls per Subscriber. (Station)	Average No. Subscribers per Operator. (Day force only.)	Average No. Connections per Operator (8 A.M. to 6 P.M.)	Average No. Wires per Operator.	Weekly Pay: High'st	Lowest	Avr'ge.	Average Daily Pay Roll of each Exchange.	Average cost of each connection.	Subscribers. Direct.	Subscribers. Circ'ts.	Trunk lines.	Extra territorial lines	Sent.	Rec'd.
Alexandria, Va.	1	9.	103.	781	74							74				
Allentown, Pa.	2	4.8	100.	434	35	3.75	3.75	3.75	3.65	.0038	34	59			11	39
Altoona, Pa.	2	6.8	47.		30	5.00			3.69	.0117	26	28	3	3		
Atlanta, Ga.	4	10.5	106.	1021	101						391	13				
Attleboro, Mass.												18				
Aurora, Ill.	1	3.7	66.	100	66	4.00			2.50	2.272	66					
Belleville, Ill.	2	5.	48.		48	10.38	2.31	5.77			95					
Binghamton, N. Y.	3	8.5	82.	545	52	5.50	3.00	4.88			98	54		3	6	8
Camden, N. J.	3	5.	92.5		80	5.00	3.75	4.37	5.38	.0125	95	33	15	17	65	65
Charleston, S. C.	3	9.7	123.	1119	123						369					
Chattanooga, Tenn.		8.7									180	2				
Chester, Pa	2	7.	143.	450	131	3.75	3.75	3.75	3.65	.007	99	22	8	2	40	37
Council Bluffs, Ia.	2		53.			7.00	4.00	5.25	4.68							
Covington, Ky	4	7.	38.5	255	34	8.08	3.46	6.35			124	13			6	8
Cumberland, Md.	1	3.2	138	334	98	7.00	5.00	6.00	5.38		68	27	2	1	16	19
Denver, Col.	9	7.3	51.6	360.8	47.9	11.66	7.00	8.65	27.69	.0077	627	39		4		
Easton, Pa	2	2.6	120	258	57	3.50	2.50	3.17	3.38	.0054	67	47			6	8
Elizabeth, N. J	1	2.5	83	180	59	6.92	5.77	6.35	2.11	.001	28	31				
Elmira, N. Y	7	5.7	42.4	244	79	5.50	3.00	4.25			255	34		8	2	13
Erie, Pa	3	4.	91.6		79	5.00	3.75	4.16			199	33	3	2	60	80
Evansville, Ind											528	20				
Hamilton, O.	1	4.	94			5.77	5.77	5.77			7	70			8	12
Harrisburg, Pa.	3	5.5	70.3	353	37.3	16.00	16.00	16.00	8.09	.0073	50	59	3		16	22
Hoboken, N. J	2	3.9	67	221	56	5.77	3.94	4.85		.0049	62	43	4	3	22	21
Joliet, Ill	1	3.7	173	528	173	7.00			6.92	1.081	173					
Lancaster, Pa.	3	4.6	69	902	40.3	2.70	2.70	2.70	5.26	.0055	31	88	1	1	4	5
Lincoln, Neb	5	5.8	55	249	52.4	6.00	5.00	7.00	8.42	.0033	241	17		4		
Macon, Ga	1	7.	150	944	140						133	7				
Memphis, Tenn											655	20				
Nashville, Tenn.	9	9.5	105.5		100	6.00	5.00	5.50	12.60	.0043	850	50				
New Brunswick, N. J.	1	2.3	121	198	88	6.25	5.00	5.63	4.23		64	24			4	5
Norfolk, Va	2	8.	121.5	858	110						215	5				
Norristown, Pa.	1	2.	60		60	11.15	11.15	11.15	2.00	.015	60			1	5	4
Omaha, Neb	8	5.1	67	275.6	57	8.75	4.50	6.26	12.36	.0032	499	17		7		
Orange, N. J	4	2.6	53.5	112	45.5	6.25	2.25	5.00			118	64			20	15
Pawtucket, R. I											23	117				
Pottsville, Pa.	4	3.3	39	112	17	22.25			4.80	.0074	36	48			5	7
Pueblo, Col.	2	6 4	62.5	350	62.5	8.12	7.00	7.56	10.77		125					
Quincy, Ill		11.									369	6				
Reading, Pa	8	4.5	58.3	237	32.6				11.50	.0045	138	155			7	6
Savannah, Ga.											267	1				
Schenectady, N. Y.	2	7.2	57	339	57.5	11.90	5.00	7.30	3.46	.0065	104	5		6	4	4
Scranton, Pa	4	3.7	77.5		34	5.50			11.43	.0066	67	134	2	1		
Springfield. Ill.		11.5									571					
Trenton, N J.	3	5.	132		83	6.50	5.00	5.62	6.15	.013	91	58	15	2	16	10
Wilkes-Barre, Pa	4	4.	88		46	5.00			9.00	.064	109	70	2	2		
Williamsport, Pa	4	3.9	66.2		42.6	5.00			9.80	.0075	96	111	3	3		
Wilmington, Del.	5	9.	80		67	6.50	3.75	5.93	6.73	.018	216	45	5	2	26	23
Woonsocket, R. I											4	46				
York, Pa																

Exchanges.	What is busiest hour of day.	Average No. of Uncompleted Connections per day.	No. of Toll or Public Stations.	Average Cost of connecting each new Subscriber.	Average daily No. of Toll Connections.	Troubles. Line.	Inst.	Time removing trouble. Line.	Instrument.	Men. Line.	Inst.	Through One Office.	Through Two Offices.	Through Three Offices.
Alexandria, Va.	10 to 11					1⅓	⅔							
Allentown, Pa.	9 to 10		2			1	3	30 m.	30 m.	1	1			
Altoona, Pa.	2 to 3	60			23	1	3	60 m.	60 m.	1	1	30 m.	50 m.	60 m.
Atlanta, Ga.	10 to 11											3 m. 40 s.		
Attleboro, Mass.														
Aurora, Ill.					12	1	5	1 h.	1 h.			4 m 50 s.		
Belleville, Ill.	10 to 11		21								1			
Binghamton, N. Y.	8 to 9		11									4 m. 45 s.		
Camden, N. J.	8 to 9		15			3	3	1 h. 30 m.	1 h. 30 m.	1	1			
Charleston, S. C.	11 to 12					1	3					3 m. 30 s.		
Chattanooga, Tenn.														
Chester, Pa	10 to 11		8			1	1	1 h.	1 h.	1	1			
Council Bluffs, Ia.	10 to 11		1							1				
Covington, Ky	10 to 11													
Cumberland, Md.	9 to 10	50	7		20	1	1	3 h.	1 h.	1	1	12 m.		
Denver, Col.	9 to 10		7			4	6	30 m.	30 m.	2	2	3 m.		
Easton, Pa	10 to 11				2	2	3	30 m.	30 m.	1	1			
Elizabeth, N. J														
Elmira, N. Y	9 to 10		14									5 m. 12 s.		
Erie, Pa	9 to 10	100	13	20.00	10	2	1	1 h.	1 h.	1	1			
Evansville, Ind														
Hamilton, O.	10 to 11													
Harrisburg, Pa.	1 to 2					2	1	30 m.	30 m.	1	2			
Hoboken, N. J	9 to 10	7				6	4	1 h. 10 m.	1 h. 4 m.	1	1			
Joliet, Ill					33	2	1	3 h.	3 h.	1	1	2 m. 33 s.		
Lancaster, Pa.	9 to 11					⅓	½	1 h.	30 m.	1	1			
Lincoln, Neb	2 to 3		3		83					1	1			
Macon, Ga	9 to 10					2⅓	⅔							
Memphis, Tenn														
Nashville, Tenn.	9 to 10	1,000			175	3	5	30 m.	30 m.	1	1	9 m. 30 s.		
New Brunswick, N. J.	9 to 10				5	2	1	1 h.	15 m.			15 m.		
Norfolk, Va	10 to 11					1⅓	2							
Norristown, Pa.										1				
Omaha, Neb	9 to 10		7		139									
Orange, N. J	8 to 9	5				6	4			3				
Pawtucket, R. I														
Pottsville, Pa.	10 to 11					2	3	30 m.	30 m.	1	1			
Pueblo, Col.														
Quincy, Ill														
Reading, Pa	10 to 11					4	5	30 m.	30 m.	1	1			
Savannah, Ga.														
Schenectady, N. Y.	10 to 11			12.33										
Scranton, Pa	8 to 9	174			11	4	6	1h. 30 m.	45 m.	1	2	45 m.	50 m.	
Springfield. Ill.														
Trenton, N J.	9 to 10		15			5	5	2 h.	2 h.	1	1			
Wilkes-Barre, Pa	9 to 10	37				7	4	1 h.	1 h.	1	2	35 m.	45 m.	
Williamsport, Pa	9 to 10	280			30	3	4	30 m.	40 m.	1	1	40 m.	60 m.	
Wilmington, Del.	8 to 9		5			2	3	1h. 30 m.		1	1			
Woonsocket, R. I														
York, Pa														

CITIES UNDER 10,000.

Of 658 Exchanges, 142 Reported.

Exchanges.	No. of Offices.	Population, (Census 1880.)	No. of Subscribers, (Stations.)	Ratio.	Average of Connections Daily. Local. 24 Hours.	Local. 8 A. M. to 6 P. M.	Local. Highest in one hour.	Trunk. 24 hours to other Offices.	Trunk. 8 A. M. to 6 P. M. to other Offices.	Trunk. Highest in 1 hour to other Offices.	No. of Employees in each Exchange. Day Operators 8 A. M. to 6 P. M. Sub'r.	Day Operators Trunk	Night Operators.	Other Employees, including Manager.	Total Employees in each Exchange.	No. of Operators required to manage office at most busy time.
Amsterdam, N. Y.	1	9,466	120	79.	594	490	97	17	13	4	2		1		3	2
Animas Forks, Col.	1	3,000	30	100.												
Asbury Park, N. J.	1	2,800	74	37.8	490	45	62	8		4	2		1	2	5	2
Astoria, N. Y.	1	3,500	22	159.1							1				1	1
Atlantic City N. J.	1	5,477	79	69.3							1		1	1	3	1
Babylon, N. Y.	1	1,800	27	66.3							1				1	1
Bath, N. Y.	1	3,183	14	22.7	116	68	26	39	30	12	1			1	2	1
Beatrice, Neb.	1	2,447	64	38.2							1			1	2	1
Bellefonte, Pa.	1	3,026	156	19.4							2		1	1	4	2
Bethlehem, Pa.	1	5,193	123	42.	370	303	58	16	14	6	2		1	1	4	2
Birmingham, Ala.	1	3,086	221	14.	2,669	2,504	511				3		1		4	3
Bloomfield, N. J.	1	5,748	54	106.4	100	75	15	35	30	6	1		1		2	1
Bloomsburg, Pa.	1	3,702	48	77.1							1			2	3	1
Boonville, Ind.	1	1,486	20	74.3												
Boulder, Col.	1	4,500	53	85.							2			1	3	2
Bradford, Pa.	1	9,197	310	29.6	1,203	844	137	64	52	15	3		1	2	6	3
Bristol, Pa.	1	5,273	10	527.3							1				1	1
Bristol, R. I.	1	6,028	48	125.6												
Burlington, N. J	1	6,090	11	553.6							1				1	1
Canajoharie, N. Y.	1	1,200	14	85.7	15	14	6	4	4	2	1				1	1
Carlisle, Pa.	1	6,209	81	76.7												
Carmi, Ill.	1	2,512	20	130.6												
Central City, Col.	1	6,000	80	75.							3			2	5	3
Charleston, W. Va.	1	4,192	36	116.4	352	308	72				1		1		2	1
Clearfield, Pa.	1	1,809	28	64.6							1				1	1
Coatsville, Pa.	1	2,766	8	345.7							1			1	2	1
Colorado Springs, Col.	1	4,226	99	42.7	300	275	50				2			2	4	2
Columbia, Pa.	1	8,312	51	163.	350	325	30	12	11	3	1		1		2	1
Columbia, Tenn.	1	3,400	71	47.9												
Conshohocken, Pa.	1	4,561	18	253.4							1				1	1
Corning, N. Y.	1	4,802	46	104.4	102	93	17	18	16	5	2		1		3	2
Corry, Pa.	1	5,277	59	89.4	307	295	47	6	6	2	1		1	1	3	1
Crested Butts, Col.	1	1,000	9	111.							1				1	1
Cuba, N. Y.	1	1,251	6	208.5	20	17	10	2	2	2	1				1	1
Curwensville, Pa.	1	706	21	33.6							1				1	1
Danville, Pa.	1	8,346	30	278.2							1				1	1
Danville, Va.	1	7,526	86	87.5	667	616	92				1		1		2	1
Darby, Pa.	1	1,779	6								1				1	1
Decatur, Ill.	1	9,547	226	42.2	2,400	2,000	260	74	66	16						
Dover, N. J	1	2,958	33	89.6	90	75	16	8	6	2	1		1		2	1
Driftwood, Pa.	1	504	12	42.							1				1	1
Dunkirk, N. Y.	1	7,248	110	65.9	431	383	62	35	29	7	2		1	1	4	2
East Greenwich, R. I.	1	2,887	43	67.1												
East New York, N. Y.	1	3,500	25	140.							1				1	1
East St. Louis, Ill.	1	9,185	21	437.4												
Elgin, Ill.	1	8,787	122	72.	438	392	50				1			2	3	1
Emmittsburg, Md.	1	847	23	32.6	301	255	45	26	20	4	1				1	1
Englewood, Ill.	1	4,076	notrep		96	82	11				1			1	2	1
Evanston, Ill.	1	4,400	80	55.	176	145	45				1			1	2	1
Far Rockaway, N. Y.	1	2,000	8	250.							1				1	1
Flemington, N. J	1	2,200	23	95.6	73	58	10				1				1	1
Flushing, N. Y.	1	6,683	67	99.7	187	148	20	14	11	2	1		1		2	1
Franklin, Tenn.	1	1,632	20	81.6												
Frederick City, Md	1	8,659	200	43.3	3,820	3,400	309	70	55	8	3	1	1	2	7	4
Freeburg, Ill.	1	1,038	9	115.3												
Freehold, N. J.	1	2,432	15	162.	28		6	3		1						
Freemont, Neb.	1	3,013	80	37.7							1			1	2	1
Gallatin, Tenn.	1	1,938	27	71.8												
Gloversville, N. Y.	1	7,133	92	77.7	310	272	47	8	7	3	1			2	3	1
Golden, Col	1	2,000	24	83.3							1			1	2	1
Grand Island, Nebraska	1	2,963	63	47.							1			1	2	1
Gunnison, Col.	1	5,000	51	98.							1			1	2	1
Hackensack, N. J.	1	4,248	35	121.4	60	45	8	22	20	8	1		1		2	1
Hackettstown, N. J.	1	2,202	27	81.5	124	103	18				1				1	1
Hagerstown, Md.	1	6,627	96	69.	362	282	56	77	67	16	1		1	3	5	1
Hastings, Neb.	1	2,817	111	25.4	506	334	59				1		1	1	3	1
Hazleton, Pa	1	6,935	79	87.8							1			1	2	1
Henderson, Ky.	1	5,365	53	101.												
Hollidaysburg, Pa.	1	3,150	35	90.							1				1	1
Hornellsville, N. Y.	1	8,195	75	109.3	136	112	22	21	18	11	2		1	1	4	2
Houtzdale, Cl'r Co. Pa.	1	2,060	36	57.2							1				1	1
Hudson, N. Y.	1	8,670	125	69.3	672	499	73	12	10	4	2		1	1	4	2
Huntingdon, Pa.	1	4,125	101	40.8							1		1	1	3	1
Ithaca, N. Y.	1	9,105	95	95.8	480	470	65	10	7	4	2		1	2	5	2
Jackson, Tenn.	1	5,377	96	56.												
Jacksonsville, Fla.	1	7,650	125	62.	690	628	103				1		1		2	1
Jamestown, Dak.	1	3,500	68	51.5	156	120	34				1		1	2	4	1
Jamestown, N. Y.	1	9,357	176	53.2	522	424	70	58	46	11	2		1	1	4	2
Jersey Shore, Pa.	1	1,411	16	88.							1			1	2	1
Knoxsville, Tenn.	1	9,693	136	71.3	1166	888	211									
Lambertville, N. J.	1	4,183	15	272.	60	55	7				1				1	1
Lansdale, Pa.	1	798	6	133.							1				1	1
Lawrenceburg, Ind.	1	4,668	39	119.7							1			1	2	1
Lebanon, Ill.	1	1,924	8	240.5												
Lebanon, Pa.	1	8,778	78	112.5	400	360	45	12	10	2	1			1	2	1
Lebanon, Tenn.	1	2,296	28	82.												
Lenni, Pa	1	300	6	50.							1				1	1
Lewistown, Pa.	1	3,222	83	38.8							1		1	1	3	1
Lock Haven, Pa.	1	5,845	60	97.4							1		1		2	1
Long Branch, N. J.	1	3,833	44	87.1	363	31	43	4		3	1				1	1
Mauch Chunk, Pa.	1	3,750	75	50.	106	100	15	1	1	1	1		1	1	3	1
Madison, N. J.	1	1,662	14	119.	15	15	5	6	6	2						
Mayville, N. Y.	1	1,051	29	36.2	28	26	8	14	12	6	2			1	3	2
Media, Pa.	1	1,919	12	151.6							1				1	1
Milton, Pa.	1	2,102	73	28.8							2		1	1	4	1
Millburn, N. J.	1	1,743	13	134.	40	35	6	10	8	4	1		1		2	1
Morris, Ill	1	3,486	112	69.7	163	130	18				1			1	2	1
Morristown, N. J.	1	5,418	76	71.3	170	130	28	12	11	4	1		1	1	3	1
Mt. Carmel, Pa.	1	2,378	1	2378.							1				1	1
Mt. Vernon, Ind.	1	3,730	21	178.												
Muncy, Pa.	1	1,174	13	90.3							1				1	1
Murfreesboro, Tenn.	1	3,800	51	74.5												
O'Fallon, Ill	1	923	2	461.5												
Osceola Mills, Pa.	1	1,253	27	46.4							1				1	1
Owego, N. Y.	1	5,525	70	79.9	402	365	218	21	16	4	1		1	1	3	1
Owensboro, Ky.	1	6,231	107	58.2												
Passaic, N. J.	1	6,532	75	85.1	158	129	20	47	35	8	1		1		2	1
Perth Amboy, N. J.	1	4,808	14	345.												
Phillipsb'g, Cen. Co. Pa.	1	1,779	55	32.3							2			2	4	1
Phœnixville, Pa.	1	6,682	11	607.5							1				1	1
Pittston, Pa.	1	7,472	51	146.5							1			2	3	1
Plainfield, N. J.	1	8,125	101	80.4	224	161	23	8	5	3	1		1	3	5	1
Pottstown, Pa.	1	5,305	55	96.5							1			1	2	1
Rahway, N. J.	1	6,455	27	239.	64	58	10	6	2	2	1		1		2	1
Renova, Pa.	1	3,708	5	742.							1				1	1
Rome, Ga	1	3,877	92	42.1	811	632	104				1		1		2	1
Rutherford, N. J.	1	1,000	6	166.6	5	5	1	10	8	2						
Salamanca, N. Y.	1	2,351	78	30.1	297	185	28	2	2	1	1		1	1	3	1
Seabright, N. J.	1	640	16	40.	120		19	2		1						
Seward, Neb.	1	1,525	34	45.							1			1	2	1
Shamokin, Pa	1	8,184	46	178.							1			2	3	1
Shelbyville, Tenn.	1	1,869	24	77.9												
Silver Cliffe, Col.	1	1,000	12	83.3							1				1	1
South Amboy, N. J.	1	3,648	2	182.4												
Summit, N. J.	1	1,000	21	47.6	50	40	10	6	5	4	1		1		2	1
Sunbury, Pa.	1	4,077	20	204.							1				1	1
Towanda, Pa	1	3,814	77	49.5	366	293	38	32	28	6	1		1	1	3	1
Troy, Pa	1	2,435	11	221.	52	49	5	23	20	3	2				2	2
Tyrone, Pa.	1	2,678	32	83.							2				2	2
Union City, Tenn.	1	3,734	67	55.7												
Valley City, Dak.	1	1,500	36	41.7	85	58	23									
Valparaiso, Ind	1	4,461	34	131.	120	95	12									
Warren, R. I.	1	4,007	34	117.8												
Warren, Pa.	1	3,500	172	20.3	869	708	110	233	166	33	3		1	4	8	3
Watkins, N. Y	1	2,716	11	247.	7	5	3	10	8	3	1				1	1
Waverly, N. Y	1	2,767	43	64.3	85	70	16	40	35	6	1			1	2	1
Wellsville, N. Y.	1	2,049	89	23.	127	103	43	66	10	15	4		1	1	6	4
West Chester, Pa.	1	7,046	70	100.7							1				1	1
Westfield, Pa.	1	579	18	32.1	17	15	5	11	9	5	1			1	2	1
Westminster, Md.	1	2,506	30	83.5	410	330	58	13	9	3	1			1	2	1
Woodbridge, N. Y.	1	4,099	14	292.8												
Woodbury, N. J.	1	2,298	16	143.6							1			1	2	1
	142	575,921	7,674													

Exchanges.	Daily average No. of Calls per Subscriber. (Station.)	Average No. Subscribers per Operator. (Day force only.)	Average No. Connections per Operator (8 A. M. to 6 P. M.)	Average No. Wires per Operator.	Weekly Pay of Operators, including Chief Operator. High'st	Lowest	Avr'ge.	Average Daily Pay Roll of each exchange, including Manager (26 days per month.)	Average cost of each connection (Exchange Pay Roll only.)	No. of Wires. Subscribers. Direct.	Subscribers. Circ'ts.	Trunk lines.	Extra territorial lines	Average daily No. connections on each Trunk Line. Sent.	Rec'd.	What is busiest hour of day.
Amsterdam, N. Y.	5.1	60.	251.	52.5	11.90	5.00	7.80	3.65	.0058	92	9		4	4	2	10 to 11
Animas Forks, Col.										30		4				
Asbury Park, N. J.	6.7	37.	23.	24.5	6.00	5.00	5.33	6.51		7	41	1		8	11	9 to 10
Astoria, N. Y.		22.		20.	Op'r	on	Com			15	3		2			
Atlantic City N. J.	3.	79	237.	75.	4.37	3.75	4.06	3.17	.012	71	4					10 to 11
Babylon, N. Y.		27.		28.	Op'r	on	Com.			19	7		2			
Bath, N. Y.	1.1	14.	98.	13.	3.50	3.50	3.50			6	3		4	39	40	8 to 9
Beatrice, Neb.		64.		66.	3.50	3.50		2.38		64			2			10 to 11
Bellefonte, Pa.	8.	78.	618.	28.5	5.00			3.27	.0026	12	43		2			10 to 11
Bethlehem, Pa.	3.1	61.5	158.	33.5	3.75	2.50	3.35	2.69	.0073	34	33			16	11	9 to 10
Birmingham, Ala.	12.	73.6	835.	73.3						219	1					10 to 11
Bloomfield, N. J.	2.5	54.	105.	44.	10.20	6.25	8.50			32	12			5	3	9 to 10
Bloomsburg, Pa.	5.3	48.	256.	27.	4.00			1.00	.039	16	8	1	2			9 to 10
Boonville, Ind.										20						
Boulder, Col.		26.5		27.5	11.62	7.00	9.31	6.15		53		1	1			
Bradford, Pa.	4.	103.3	299.	57.3	8.75	5.00	6.56			98	71	1	2	16	24	10 to 11
Bristol, Pa.	1.	10.	10.	12.	1.91	1.91	1.91	.32	.017	10			2	5	3	
Bristol, R. I.										2	13					
Burlington, N. J	1.	11.	11.	12.	1.86	1.86	1.86	.31	.026	11			1			
Canajoharie, N. Y.	1.3	14.	18.	13.	3.50		3.50	.58	.0027	7	3		3	1⅓	⅔	10 to 11
Carlisle, Pa.								.4	.0044	81						
Carmi, Ill.										20						
Central City, Col.		27.		28.	7.00	7.00	7.00	9.24		80		2	2			
Charleston, W. Va.	9.8	36.	308.	34.						32	2					10 to 11
Clearfield, Pa.	4.	28.	112.	21.	5.00			.76	.067	13	6	1	1			7to8p.m.
Coatsville, Pa.	2.	8.	16.	8.	1.62	1.62	1.62	.27	.015	8						
Colorado Springs, Col.		50.		51.	10.50	7.00	8.75	6.73		99		1	2			
Columbia, Pa.	7.1	51.	336.	44.	2.50	2.50	2.50	.84	.0052	22	20		2	3	7	9 to 10
Columbia, Tenn.										69	1					
Conshohocken, Pa.	1.	18.	18.	19.	8.29	8.29	8.29	1.38	.04	18			1	5	4	
Corning, N. Y.	2.6	23	50.	22.5	3.75	3.75	3.75			37	4	1	3	4	5	8 to 9
Corry, Pa.	5.3	59.	301.	38.	3.75	3.75	3 75			21	16		1	6	7	8 to 9
Crested Butts, Col.		9.		9.	7.00	7.00	7.00	1.15		9						
Cuba, N. Y.	3.7	6.	19.	5.	Op'r	on	Com.			2	2		1	2	2	8 to 9
Curwensville, Pa.	4.	21.	84.	13.	3.00			.46	.055	4	8	1				7to8p.m.
Danville, Pa.	3.	30.	91.	24.	4.00			.57	.063	17	6	1				9 to 10
Danville, Va.	7.8	86.	6.16	83.						80	3					9 to 10
Darby, Pa.	1.	6.	6.	8.	1.30	1.30	1.30	.20	.02	6		2	2	2	1	
Decatur, Ill.	11.									226						
Dover, N. J	3.	33.	81.	29.	6.25	2.50	4.37	1.35	.0409	16	13			3	4	9 to 10
Driftwood, Pa.	4.	12.	48.	5.	Op'r	on	Com.			2	3					11 to 12
Dunkirk, N. Y.	4.	55.	206.	51.	6.25	4.50	5.38			86	12	1	3	9	11	9 to 10
East Greenwich, R. I.										1	11					
East New York, N. Y.		25.		23.	Op'r	on	Com.			22	1		3			
East St. Louis, Ill.										21						
Elgin, Ill.	3.6	122.	392.	122.	7.00			4.80	.019	122						
Emmittsburg, Md.	14.2	23.	281.	16.	3.00	3.00	3.00	.50		13	3			26	13	10 to 11
Englewood, Ill.					4.00			1.42	.0141							
Evanston, Ill.	2.2	80.	145.	80.	5.00			2.10	.0119	80						
Far Rockaway, N. Y.		8.		8.	Op'r	on	Com.			5	1		2			
Flemington, N. J	3.2	23.	73.	10.	2.25	2.25	2.25	.34	.0027	8	2					9 to 10
Flushing, N. Y.	3.	67.	159.	60.	3.00	3.00	3.00	1.00	.0062	46	10		4			
Franklin, Tenn.										20						
Frederick City, Md	14.4	50.	863.7	37.	5.00	1.50	3.60	5.28		127	21			96	80	10 to 11
Freeburg, Ill.										9						
Freehold, N. J.	2.				Op'r	on	Com.			11	1	3		3	3	1 to 2
Freemont, Neb.		80.		81.	4.00	4.00		2.40		80			1			10 to 11
Gallatin, Tenn.										37						
Gloversville, N. Y.	3.5	92.	279.	94.	8.00		8.00	3.42	.0095	92			2	4	3	10 to 11
Golden, Col		24.		27.	7.00	7.00	7.00	2.69		21	1	1	4			
Grand Island, Nebraska		63.		63.	4.00	4.00	7.06	2.40		63						varies.
Gunnison, Col.		51.		51.	5.83	5.83	5.83	3.84		51						
Hackensack, N. J.	2.3	35.	65.	33.	6.25	6.25	6.25	1.92	.034	13	20			2	3	9 to 10
Hackettstown, N. J.	4.6	27.	103.	24.	3.00	3.00	3.00	.46	.0030	22	2					9 to 10
Hagerstown, Md.	4.5	96.	349.	83.	5.00	5.00	5.00	6.96		68	12	1	2	29	22	8 to 9
Hastings, Neb.	4.6	111.	334.	111.					.0046	111						8 to 9
Hazleton, Pa	1.9	79.	140.	37.	5.00			1.35	.104	15	20		2			8 to 9
Henderson, Ky.										53						
Hollidaysburg, Pa.	4.	35.	140.	16.	4.00			.57	.004	5	9	2				2 to 3
Hornellsville, N. Y.	2.1	38.	65.	26.5	Op'r	on	Com.			27	23	1	3	5	8	8 to 9
Houtzdale, Cl'r Co. Pa.	6.6	36.	238.	23.	4.00			.69	.0029	11	10	2				2 to 3
Hudson, N. Y.	5.5	63.	255.	44.	7.00	3.00	5.00	4.23	.006	56	27		4	3	3	10 to 11
Huntingdon, Pa.	3.8	101.	385.	47.	5.00			2.89	.0075	17	29		1			8 to 9
Ithaca, N. Y.	5.2	48.	239.	50.	3.50	3.50	3.50			95			5	2	3	9 to 10
Jackson, Tenn.										96						
Jacksonsville, Fla.	5.5	125.	628.	120.						117	3					2 to 3
Jamestown, Dak.	2.4	68.	58.	68.	5.00	5.00	5.00	3.75		68						5to6p.m.
Jamestown, N. Y.	3.3	88.	235	78.	5.00	3.00	4.00			114	39	1	2	14	21	9 to 10
Jersey Shore, Pa.	4.5	12.	69.	15.	3.00			.46	.0067	8	4	2	1			9 to 10
Knoxsville, Tenn.	8.6									132	1					
Lambertville, N. J.	4.	15.	55.	12.	2.50	2.50	2.50	.38	.0052	10	2					9 to 10
Lansdale, Pa.	1.	6.	6.	7.	1.42	1.42	1.42	.23	.026	6			1	1	1	
Lawrenceburg, Ind.	4.	39.	175.	31.	5.77	5.77	5.77			23	8			5	8	10 to 12
Lebanon, Ill.										8						
Lebanon, Pa.	5.3	78.	370.	40	3.50			2.10	.0052	8	32			6	5	10 to 11
Lebanon, Tenn.										28						
Lenni, Pa	1.	6.	6.	7.	.75	.75	.75	.12	.012	6			1	1	1	
Lewistown, Pa.	3.2	83.	263.	43.	5.00			2.88	.0019	21	21		1			9 to 10
Lock Haven, Pa.	1.8	60.	105.	34.	6.00			1.27	.0026	12	20		2			9 to 10
Long Branch, N. J.	8.3	44.	30.	35.	10.00	5.00	7.50	2.31		13	17	5		4	7	11 to 12
Mauch Chunk, Pa.	1.4	75.	107.	26.	3.25	2.50	2.87	2.42	.0022	19	7			1	2	10 to 11
Madison, N. J.	1.5									12	1					
Mayville, N. Y.	1.4	15.	15.	15.	Op'r	on	Com.			4	9	1	1	3	4	9 to 10
Media, Pa.	1.	12.	12.	16.	3.10	3.10	3.10	2.51	.023	12			4	5	4	
Milton, Pa.	2.	37.	150.	22.	5.00			81	.0187	24	14		3			9 to 10
Millburn, N. J.	3.8	13.	43.	9.	Op'r	on	Com.			7	2			5	3	8 to 9
Morris, Ill	3.3	51.	30.	50.	5.00			1.95	.1196	50						
Morristown, N. J.	2.4	76.	143.	63.	5.00	5.00	5.00	1.54	.0088	28	35			2	3	9 to 10
Mt. Carmel, Pa.																
Mt. Vernon, Ind.										21						
Muncy, Pa.	4.6	13.	63.	5.	3.00			.46	.0067		3	1	1			9 to 10
Murfreesboro, Tenn.										51						
O'Fallon, Ill										2						
Osceola Mills, Pa.	5.9	27.	158.	22.	4.00			.69	.0044	16	4	2				2 to 3
Owego, N. Y.	6.	70.	381.	49.	Op'r	on	Com.			20	21	1	7	5	6	9 to 10
Owensboro, Ky.										99	4					
Passaic, N. J.	2.7	75.	164.	71.	5.00	3.75	4.37	1.35	.0108	48	23			3	4	10 to 11
Perth Amboy, N. J.					Op'r	on	Com.			10	3					
Phillipsb'g, Cen. Co. Pa.	6.6	28.	362.	16.	4.00			2.73	.0075	13	15	2	2			2 to 3
Phœnixville, Pa.	1.	11.	11.	12.	1.85	1.85	1.85	.30	.017	11			1			
Pittston, Pa.	4.	51.	204.	22.	4.00			1.00	.0049	3	17	2		60	40	1 to 2
Plainfield, N. J.	2.3	101.	166.	98.	6.00	5.00		7.33		94	4			2	2	8 to 9
Pottstown, Pa.	2.	55.	111.	48.	5.00	5.00	5.00	1.77	.015	37	7	2	2			
Rahway, N. J.	2.6	27.	60	22.	7.00	3.50		1.73		17	5					
Renova, Pa.	5.2	5.	26.	5.	Op'r	on	Com.			5						9 to 10
Rome, Ga	8.8	92.	632.	89.						86	3					8 to 9
Rutherford, N. J.	2.5									2	3					
Salamanca, N. Y.	3.8	78.	187.	67.	3.75	3.75	3.75			50	15		1		2	9 to 10
Seabright, N. J.	8.				Op'r	on	Com.			15	1	1		2	5	11 to 12
Seward, Neb.		34.		34.	12.00	12.00	12.00	1.90		34				2		varies.
Shamokin, Pa	3.	46.	120.	30.	4.00			1.00	.0083	13	13	2	2			10 to 11
Shelbyville, Tenn.										24						
Silver Cliffe, Col.		12.		12.	7.00	7.00	7.00	1.15		12						
South Amboy, N. J.					Op'r	on	Com.				1					
Summit, N. J.	2.7	21.	45.	19.	Op'r	on	Com.			17	2					
Sunbury, Pa.	1.3	20.	30.	14.	3.00			.46	.0153	8	5	1				9 to 10
Towanda, Pa	5.2	77.	322.	71.	Op'r	on	Com			60	8		3	10	14	8 to 9
Troy, Pa	7.	6.	35.	6.	Op'r	on	Com.			6	2	1	3	6	3	8 to 9
Tyrone, Pa.	4.	16.	128.	10.	4.00			1.15	.009	9	11	1				9 to 10
Union City, Tenn.										63	2					
Valley City, Dak.																
Valparaiso, Ind		34.		34.	5.00			1.95	.1625	34						
Warren, R. I.											9				88	
Warren, Pa.	6.4	57.	291.	40.	7.00	5.00	6.00			70	41	6	3	58		10 to 11
Watkins, N. Y	1.6	11.	13.	11.	Op'r	on	Com.			5	3		3	2	4	8 to 9
Waverly, N. Y	9.	43.	105.	39.	Op'r	on	Com.			33	3		3	13	7	9 to 10
Wellsville, N. Y.	2.2	22.	28.	15.	7.00	3.75	5.40			30	26	3	3	2	2	9 to 10
West Chester, Pa.	3.	70.	210.	71.	12.81	12.81	12.81	2.12	.01	70			1			
Westfield, Pa.	1.5	18.	24.	15.	Op'r	on	Com.			10	2		3	4	4	9 to 10
Westminster, Md.	14.1	30.	339.	24.	3.00	3.00	3.00	.50		20	4			13	10	10 to 11
Woodbridge, N. Y.					Op'r	on	Com.			12	1					
Woodbury, N. J.	1.	16.	16.	17.	7.50	7.50	7.50	1.58	.03	16			1			

Exchanges.	Average No. of Uncompleted Connections per day.	No. of Toll or Public Stations.	Average Cost of connecting each new Subscriber.	Average daily No. of Toll Connections.	Average Daily No of troubles. Line.	Inst.	Average time consumed removing trouble. Line.	Instrument.	No. of Men Employed on troubles. Line.	Inst.	Total Time consumed making Ten Consecutive Connections from first call to last disconnection. Through One Office.	Through Two Offices.	Through Three Offices.
Amsterdam, N. Y.			12.33										
Animas Forks, Col.													
Asbury Park, N. J.		1		17	1	2	1 h.	30 m.	1	1			
Astoria, N. Y.													
Atlantic City N. J.									1	1			
Babylon, N. Y.													
Bath, N. Y.		15									4 m. 45 s.		
Beatrice, Neb.		1							1				
Bellefonte, Pa.	56			22	⅓	1	50 m.	30 m.	1	1	25 m.		
Bethlehem, Pa.					1	2	30 m.	30 m.	1	1			
Birmingham, Ala.					1⅓	4⅓					3 m. 21 s.		
Bloomfield, N. J.	1				2	2			1				
Bloomsburg, Pa.	11			5	⅓	⅓	60 m.	40 m.	1	1	35 m.	45 m.	
Boonville, Ind.													
Boulder, Col.													
Bradford, Pa.		28									7 m. 45 s.		
Bristol, Pa.													
Bristol, R. I.													
Burlington, N. J													
Canajoharie, N. Y.			15.00										
Carlisle, Pa.													
Carmi, Ill.													
Central City, Col.													
Charleston, W. Va.													
Clearfield, Pa.	11			16									
Coatsville, Pa.									1				
Colorado Springs, Col.													
Columbia, Pa.					1	1	3 h.	3 h.					
Columbia, Tenn.													
Conshohocken, Pa.													
Corning, N. Y.		4									5 m. 30 s.		
Corry, Pa.		4									5 m. 48 s.		
Crested Butts, Col.													
Cuba, N. Y.		1									5 m. 30 s.		
Curwensville, Pa.	9												
Danville, Pa.	7			5	⅓	⅓	30 m.	30 m.	1	1	45 m.	50 m.	
Danville, Va.													
Darby, Pa.		2											
Decatur, Ill.													
Dover, N. J		1		20	1¼	¼	15 m.	15 m.					
Driftwood, Pa.	7										38 m.		
Dunkirk, N. Y.		5									4 m.		
East Greenwich, R. I.													
East New York, N. Y.													
East St. Louis, Ill.													
Elgin, Ill.				33	2	4	1 h.	1 h.	1	1	8 m.		
Emmittsburg, Md.	1		30.00	10	1		1 h.	30 m.			6 m.	10 m.	15 m.
Englewood, Ill.				46	¼	¼					5 m. 30 s.		
Evanston, Ill.				44	½	⅓	1 h.	1 h.			2 m.		
Far Rockaway, N. Y.													
Flemington, N. J					2	3	1 h.	1 h.		1			
Flushing, N. Y.									1				
Franklin, Tenn.													
Frederick City, Md	5		30.00	25	5	3	1 h.	30 m.			6 m.	10 m.	15 m.
Freeburg, Ill.													
Freehold, N. J.		2		3									
Freemont, Neb.		1							1				
Gallatin, Tenn.													
Gloversville, N. Y.			12.00										
Golden, Col													
Grand Island, Nebraska									1				
Gunnison, Col.													
Hackensack, N. J.				30	¼	1	15 m.	15 m.					
Hackettstown, N. J.		1		1	2	3	2 h.	2 h.					
Hagerstown, Md.	48	12		24	5	3	1 h.	1 h.	1	1	15 m.		
Hastings, Neb.	10		20.00		2	2	20 m.	20 m.			5 m.		
Hazleton, Pa	2			11	2	6	30 m.	1 h.	1	1	30 m.		
Henderson, Ky.													
Hollidaysburg, Pa.	16												
Hornellsville, N. Y.		3									5 m.		
Houtzdale, Cl'r Co. Pa.	7												
Hudson, N. Y.			12.00										
Huntingdon, Pa.	10			11	1	2	1 h.	30 m.	1	1	30 m.		
Ithaca, N. Y.		20									4 m. 45 s.		
Jackson, Tenn.													
Jacksonsville, Fla.					1	1⅓							
Jamestown, Dak.			5.00		2	1	30 m.	10 m.	1	1			
Jamestown, N. Y.		12									5 m. 30 s.		
Jersey Shore, Pa.	20			2							40 m.	60 m.	
Knoxsville, Tenn.													
Lambertville, N. J.							1 h.	1 h.					
Lansdale, Pa.													
Lawrenceburg, Ind.													
Lebanon, Ill.													
Lebanon, Pa.					1	2	1 h.	1 h.	1	1			
Lebanon, Tenn.													
Lenni, Pa													
Lewistown, Pa.	9			4		⅓		30 m.	1	1	45 m.		
Lock Haven, Pa.	15			20		1		45 m.	1	1	30 m.	40 m.	
Long Branch, N. J.		2		2	2		1 h.		1	1			
Mauch Chunk, Pa.		1		1	1	1	1 h.	1 h.	1	1			
Madison, N. J.		2		8	½		15 m.	15 m.					
Mayville, N. Y.		2									4 m. 45 s.		
Media, Pa.													
Milton, Pa.	2			15	1	1	30 m.	30 m.	1	1	30 m.		
Millburn, N. J.	3				1	1							
Morris, Ill				7	½	½	1 h.	1 h.			2 m. 30 s.		
Morristown, N. J.				30	½	1	15 m	15 m.	1				
Mt. Carmel, Pa.													
Mt. Vernon, Ind.													
Muncy, Pa.	18			3							40 m.	60 m.	
Murfreesboro, Tenn.													
O'Fallon, Ill													
Osceola Mills, Pa.	4												
Owego, N. Y.		11									5 m. 15 s.		
Owensboro, Ky.													
Passaic, N. J.				50	1	1	15 m.	15 m.					
Perth Amboy, N. J.													
Phillipsb'g, Cen. Co. Pa.	13			27	3	4	1 h.	1 h. 30 m.			30 m.	40 m.	5 m.
Phœnixville, Pa.													
Pittston, Pa.	21				4	3	1 h. 10 m.	1 h.	1	1	45 m.	1 h.	
Plainfield, N. J.		1			2								
Pottstown, Pa.		2			1								
Rahway, N. J.		1			1								
Renova, Pa.	6												
Rome, Ga					⅓	⅔							
Rutherford, N. J.				8									
Salamanca, N. Y.		3									4 m. 48 s.		
Seabright, N. J.		1											
Seward, Neb.													
Shamokin, Pa	12			4	1	2	1 h.	40 m.	1	1	50 m.	60 m.	
Shelbyville, Tenn.													
Silver Cliffe, Col.													
South Amboy, N. J.													
Summit, N. J.	3				1	1							
Sunbury, Pa.	2										50 m.	60 m.	
Towanda, Pa		14									5 m. 30 s.		
Troy, Pa		13									6 m. 15 s.		
Tyrone, Pa.	15												
Union City, Tenn.													
Valley City, Dak.													
Valparaiso, Ind				5	¼	½	1 h.				4 m.		
Warren, R. I.													
Warren, Pa.		23									4 m. 30 s.		
Watkins, N. Y		17									6 m.		
Waverly, N. Y		5									5 m. 15 s.		
Wellsville, N. Y.		11									5 m. 15 s.		
West Chester, Pa.					1								
Westfield, Pa.		30									5 m. 15 s.		
Westminster, Md.	4		30 00	6	1		1 h.	30 m.	1	1	6 m.	10 m.	15 m.
Woodbridge, N. Y.													
Woodbury, N. J.		1											

Table No. 2 shows the number of branch offices in each exchange. We have no reports from Pittsburgh or Boston. In this there appears to be little change from year to year, but that little points to centralization and the reduction of the number of offices.

No. 2. BRANCH OFFICES.	1884.	1883.	1882.
Albany, N. Y.	1	3	3
Boston, Mass.	..	4	4
Brooklyn, N. Y.	3	..	..
Buffalo, N. Y.	2	..	..
Chicago, Ill.	9	10	11
Cincinnati, O.	8	10	10
Cleveland, O.	4	4	..
New York, N. Y. Law. 8 Met. 9	12	8	8
Philadelphia, Pa.	7	..	..
Pittsburgh, Pa.	..	7	..
St. Louis, Mo.	6	..	..
Washington, D. C.	9	..	..

All others have one office only.

Number of Exchanges reporting	211
Number of Offices	261

Table No. 3 shows the average number of connections per subscriber daily, and is a report which is compared one year with another. The great variety in these figures and the differences, in many cases, throw a doubt on their reliability. There are some, however, and those the most important, that we know to be correct, and they show a gradual increase in the use of the telephone. New York city, which shows the largest increase in the number of subscribers, shows no increase in the average number of connections per subscriber ; Chicago and Brooklyn show a very slight increase. From this I think it is fair to assume that the number of connections per subscriber does not depend upon the number of subscribers, nor on the increase, but rather on the efficiency of the service and the general business characteristics of each exchange.

By that, I do not mean any reflection upon the Telephone Service in New York city. This simply shows by the figures there has been no gain in the average number of connections, and it may be that the diminished average arises from the new subscribers whose use is small, which reduces the general average.

Of course we have a right to expect that as business adapts itself to the telephone, and relies more and more on its use, the average must increase. The number of calls per subscriber in Buffalo under the toll system shows a continued increase. Baltimore shows an improvement due to the multiple switch-board.

Average Daily No. of Connections per Subscriber.

No. 3.	No. of Subr's	1884.	1883.	1882.	1881.
Albany, N. Y.	1,142	7.2	7.2		
Atlanta, Ga.	423	10.5	5.5		
Baltimore, Md.	1,450	6.8	5.	4.85	3.78
Brooklyn, N. Y.	1,846	3.6	3.02		
Buffalo, N. Y.	1,420	4.36	3.67	2.42	
Charleston, S. C.	369	9.7	7.14		
Chicago, Ill	3,246	8.4	7.68	6.17	5.28
Cincinnati, O.	2,238	9.6	7.07	9.08	7.23
Cleveland, O.	1,617	6.6	5.92		
Covington, Ky.	154	7.	8.		
Denver, Col.	723	7.3	6.03	5.51	
Elizabeth, N. J.	83	2.5	3.		
Hoboken, N. J.	134	3.9	7.		
Jersey City, N. J.	391	2.7	5.5		
Milwaukee, Wis.	1,165	3.4	6.36		
Law	598	7.2	13.96	10.	
New York, N. Y.	4,210	5.1	5.03	4.85	3.73
Paterson, N. J.	551	3.3	4.		
Philadelphia, Pa.	2,199	8.	7.		
Providence, R. I.	1,892	5.	5.05	4.76	
Richmond, Va.	354	8.8	7.3		
Rochester, N. Y.	724	3.2	3.82	3.54	

Table No. 4 gives the average number of connections daily, and tells the same story as No. 3 in a little different form.

Average Daily No. of Connections.

No. 4.	1884.	1883.	1882.	1881.
Albany, N. Y.	8,258	7,543	4,593	6,582
Atlanta, Ga.	4,421	1,442		
Brooklyn, N. Y.	5,508	4,741		
Buffalo, N. Y.	5,480	5,292	3,842	2,394
Charleston, S. C.	3,615	2,427		
Chicago, Ill.	27,101	22,000	16,044	16,136
Cleveland, O.	10,769	13,460		
Denver, Col.	5,298	4,179	3,450	
Elizabeth, N. J.	209	210		
Hoboken. N. J.	530	885		
Jersey City, N. J.	1,070	1,940		
Law	4,333	7,032	5,792	
New York, N. Y.	21,579	18,858	13,935	10,271
Paterson, N. J.	1,805	1,757		
Philadelphia, Pa.	19,145	14,770		
Richmond, Va.	3,013	2,546		
Rochester, N. Y.	2,320	2,319	2,044	

MR. ECKERT—Excuse me; but does not that show a difference there?

MR. SARGENT—New York shows in 1881 an average daily number of connections of 10,271; in 1882, of 13,935; in 1883, of 18,858; in 1884, of 21,579.

MR. ECKERT—That is what I mean. That is an increase from year to year, and shows that New York has doubled the daily number of connections in four years, beginning at 1881 and ending with 1884.

MR. SARGENT—Perhaps I ought also to say to the members of the Association that Mr. Eckert has called my attention to an apparent injustice done the New York office in the last year's report, inasmuch as he assumed the number of connections to be counted double by other offices. The fact is, they were not counted in that way. We counted it as one connection, and not as two. The point the Committee want to make is that the *daily average per subscriber* has not increased. The *total number of connections* has increased with the number of subscribers.

MR. ECKERT—The understanding that you and I had before the report was made was that two subscribers connected should be counted as a conversation.

MR. SARGENT—That was the understanding, and that is what I am trying to get into these reports; but, as I said before, the figures are so irregular that I am satisfied some of the offices have not reported them correctly, and are making the figures in different ways.

Trusting that I have made myself clear on that point, I will proceed.

Table No. 5 shows the average number of connections daily per operator. But we think the different offices have taken different ways to arrive at these results, and they are, therefore, unreliable for comparative purposes. The increase is notable in the large offices—New York, Chicago, Brooklyn and Philadelphia.

The next table shows the number of uncompleted connections, which is growing to be a very important item in all exchange work.

Average No. Connections per Operator.

(8 A. M. to 6 P. M.)

No. 5.	1884.	1883.	1882.
Albany, N. Y	392.9	503	353.
Brooklyn, N. Y	177.	132.8	....
Buffalo, N. Y	221.	263.	148.
Chicago, Ill	271.	202.	161.
Cincinnati, O	218.	295.	262.
Cleveland, O	175	263.	....
Covington, Ky	255.	282.	....
Denver, Col	360.8	379.	246.
Elizabeth, N. J	180.	183.	....
Hoboken, N. J	221.	380.	....
Jersey City, N. J	137.	237.	....
Milwaukee, Wis	203.	269.	....
New York, N. Y. Law	481.	575.	526.
New York, N. Y.	145.	120.	114.
Paterson, N. J	147.7	175.	....
Philadelphia, Pa. Law	609.2	....	....
Philadelphia, Pa.	147.6	267.	....
Rochester, N. Y	202.6	262.	256.

Out of 16 offices, 2 show an increase ; 14 show a decrease.

Uncompleted Connections.

No. 6.	Number.	Percentage.
Baltimore, Md	800	.08
Brooklyn, N. Y	634	.11
Buffalo, N. Y	520	.09
*Chicago, Ill	1355	.05
New York, N. Y	1789	.08
Washington, D. C	602	02
Nashville, Tenn	1000	.11
Scranton, Pa	174	.10
†Williamsport, Pa	280	.21†

*Chicago adds, in an explanatory note, that when a party is busy, the call is held and answered afterwards, which explains their small percentage. We do not do that in Brooklyn.

†I think that may be a mistake.

Mr. Durant—What is meant by "uncompleted connections?"

Mr. Sargent—An "uncompleted connection" is a connection that starts, but does not reach its destination, from any cause.

MR. DURANT—Whether it is due to broken wires, or other cause?

MR. SARGENT—Yes, sir; for any cause.

MR. FAY—Busy wires is one of the most common reasons, is it not?

MR. SARGENT—Yes, sir. That is one of the most frequent; I will read what I have to say on that subject.

The number of uncompleted connections may mean bad service, but is not an absolute indication; otherwise the Chairman of your Committee should feel badly, as Brooklyn has the highest percentage of uncompleted connections. An examination of the reasons why these connections did not get through show that from two-thirds to three-fourths of the number were because the wire was busy, or the party would not answer.

I will say that in all the observations I have made personally of these nncompleted connections, the faults are not faults that can be corrected by management. Either the wire is broken, or the wire is crossed, or some other unavoidable accident has happened. A busy wire is one of the most common reasons. Fully two-thirds of these faults are due to the fact that the subscriber is busy, or will not answer.

MR. PHILLIPS—Is it not due to the fact that the subscriber is talking to somebody else, and will not answer?

MR. SARGENT—Presumably, when a subscriber will not answer, he is supposed to be out of his office, or out of hearing. By "busy" we mean the subscriber is talking to another subscriber.

Table No. 7 shows the average number of subscribers to each operator. Seventeen offices show an increase in the number and four a decrease. The increased number of subscribers handled by the operator is due generally to the improved facilities furnished by switch-boards. New York and Chicago have more than doubled, and Brooklyn has nearly doubled. The highest average comes from the smaller offices in the South, which are operated under the Law system; the Law system, however, in the larger cities, does not appear to compare so favorably as it does in the smaller.

MR. FAY—I wish you would correct the Chicago report before it is printed. You remember that I spoke to you about it before. When I made up that report I took the whole number of operators and the whole number of subscribers.

MR. SARGENT—That is the fair way of getting at it, and that is the way it will be done before it is printed.

Average No. Subscribers per Operator.

No. 7.	1884.	1883.	1882.	1881.
Albany, N. Y.	63.4	72.	76.9	..
Atlanta, Ga.	106.	124.	....	..
Baltimore, Md.	85.3	37.	19.4	42
Brooklyn, N. Y.	68.3	48.		..
Buffalo, N. Y.	67 6	67.	40.3	..
Charleston, S. C.	123.	85.	....	..
Chicago, Ill.	34.9	31.	25.4	24
Cincinnati, O.	33.9	32.	26.7	24
Cleveland, O.	33.	33.	....	..
Covington, Ky.	38.5	37.	....	..
Denver, Col.	51.6	56.	....	..
Elizabeth, N. J.	83.	70.	....	..
Hoboken, N. J.	67.	52	....	..
Jersey City, N. J.	55.9	57.	....	..
Milwaukee, Wis.	64.7	46.	....	..
Nashville, Tenn,	105.5	110.	....	..
Law) New York, N. Y)	66.4	56.	52.5	..
	29.2	23.	25.5	23
Paterson, N. J.	50.9	53.	....	..
Philadelphia, Pa.	37.9	38.	....	..
Richmond, Va.	88.5	69.4	....	...
Rochester, N. Y.	65.8	75.	68.6	..

Table No. 8 shows the cost per connection.

Average Cost per Connection.

No. 8.	1884.	1883.	1882.	
Albany, N. Y.	.0065	.0089	.0050	....
Baltimore, Md	.0040	.0058	.0072	....
Brooklyn, N. Y.	.0069	.0098	....	....
Buffalo, N. Y.	.0060	.0047	.0072	.0133
Chicago, Ill.	.0054	.0064	.0073	.0104
Cleveland, O.	.0050	.0060	....	....
Denver, Col.	.0077	.0072	.0044	...
Hoboken, N. J.	.0019	.0050	...	....
Jersey City, N. J.	.0071	.0070	....	....
Milwaukee, Wis.	.0113	.0055	....	....
Law) New York, N. Y)	.0020	.0024	.0023	....
	.0066	....	....	....
Paterson, N. J.	.0051	.0090	...	....
Rochester, N. Y.	.0055	.0041	.0042	....

Out of 12 offices, 5 show an increase ; 7 show a decrease.

Table No. 9 shows the average time of making ten consecutive connections. Six offices show an increased speed, and two show a loss. The quickest connections appear to be made on the multiple board and the Law system.

TIME MAKING 10 CONSECUTIVE CONNECTIONS ON SAME WIRE.

No. 9.	1884.			1883.			1882.		
	1 office.	2 offices.	3 offices.	1 office.	2 offices.	3 offices	1 office.	2 offices.	3 offices
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Brooklyn, N. Y ..	10. 45	10. 45	13.	10.	12.	13	....	....	....
Buffalo, N, Y....	6.	8. 15	....	7.	9. 30	....	5. 13	9. 47	....
Chicago, Ill.....	7. 5	11. 38	....	10. 50	14. 36	....	20. 30	29. 45	....
Denver, Col	3.	....	....	3.	....	....	5. 30	....	....
Milwaukee, Wis. .	4. 15	....	....	9.	....	....	....	....	....
Law, ...)		....	....	1. 30	2.	....	50	1. 8	....
New York, N.Y)	....	....	....	....	....	....	....	....	....
Paterson, N. J ...	20.	30.	40.	45.	....	..	....	....	....
Providence, R. I..	7. 50	12.	....	9. 10	14. 20		13. 48	18. 45	....
Rochester, N. Y..	6.	....	....	10.	....	....	18. 33	....	....

Table No. 10 shows the number of trunk and extra territorial lines.

Table No. 11 gives the average number of connections daily on each trunk.

No. 12 shows the capacity of the various switches whether cord or plug, and the number of the various styles in use.

NO. OF TRUNK AND EXTRA TERRITORIAL LINES.

No. 10.	1884.	1883.	1882.
Albany, N. Y.....	50	69	55
Brooklyn, N. Y.....	104	89	..
Buffalo, N. Y.....	37	26	21
Chicago, Ill.....	254	245	228
Cincinnati, O.....	199	312	277
Cleveland, O	40	63	..
Hoboken, N. J.....	7	6	..
Jersey City, N. J.....	62	32	..
Milwaukee, Wis.....	8	6	..
Law.....)	106	59	20
New York, N.Y...)	491	339	274
Paterson, N. J.....	14	11	..
Philadelphia, Pa.....	56	74	..
Providence, R. I	42	38	48

Brooklyn, per cent. to Subscribers.....5 per cent.
Chicago, " " .....7 "
Cincinnati, " " .....8 "
New York, " " .....11½ "

Average Daily No. Connections on Each Trunk.

No. 11.	1884.	1883.	1882.	1881.
Albany, N. Y.	72.	56.	48.	66.
Brooklyn, N. Y.	22.6	28.5	...	...
Buffalo, N. Y.	39.	50.	41.	21.
Chicago, Ill.	38.	56.	47.	48.
Cincinnati, O.	8.	21.4	...	...
Covington, Ky.	7.	14.	...	...
Hoboken, N. J.	22.	14.	...	...
Jersey City, N. J.	47.	15.	...	...
Law	23.	57.7	57.	...
New York, N. Y.	31.	41.	31.	23.
Paterson, N. J.	6.	15.	...	...
Philadelphia, Pa	54.	52.	...	...

Capacity of Switches in Wires.

No. 12.	Cord.	Plug.	Slide.
1884.	38,070	23,418	275
1883.	21,432	12,763	...
1882.	16,799	12,755	...
1881.	8,893	11.904	...

Switch Boards in Use.

MAKERS.	1884.		1883.	1882.	1881.
	No. of Offices.	Capacity in Wires.	No. of Offices.	No. of Offices.	No. of Offices.
Western Elec. Co., Standard	69	13,425	..	....	....
Western Elec. Co., Multiple	5	11,900	31	....	....
Gilliland Man'f'g Co.	35	7,160	15	....	....
Charles Williams, Jr.	55	4,523	17	....	....
Breckinridge	7	5,900	1	....	...
Law Tel. & Tel. Co	10	6,750	1	....	....
Utica Fire Alarm	5	1,625	1	....	....
So. Bell Tel. & Tel. Co	6	1,375	..	....	....
C. E. Jones and Bro.	6	1,223	5	....	....
Nebraska Tel. Co	1	1,000	..	....	....
Bergman & Co.	1	4,200	1	....	....
Davis & Watts	2	200	4	..	....
B. T. Co., of Miss.	3	220	..	....	....
Post & Co.	3	100	9	....	....
Detroit Elec. Works	1	1,450	..	....	....
Chester	1	512	..	....	...
Bunnell	1	50	..	....	....
Watson	2	100	..	....	....
Standard Elec. Co.	1	50	..	....	....
		61,763			

MR. STORKE—Is the cord system gaining?

MR. SARGENT—It is gaining. Between 1883 and 1884 the cord system in some places was doubled.

MR. FAY—That is owing to the variation in the report. Some officers report one year, and do not report the next.

MR. STORKE—Is this an average of different offices?

MR. SARGENT—It is an average of different offices.

Five of the largest offices are now using the multiple board, and its effect may be noticed in the increased number of calls, number of wires handled, and speed of connecting. Strange to say, however, the multiple board in none of these places is being used on the multiple principle; that is, one operator in control of a group of subscribers with convenient access to every other subscriber in the system; but, instead, the one operator has one-half the system, and is, therefore, compelled to reach over for the other half. It would seem that the advantages to be gained in putting in jacks enough to complete the system would more than compensate for the expense. Until this is done, the multiple board can never show its perfect work.

The general drift of all the figures we have just discussed may be said to indicate a healthy condition of business; the average use of the telephone has increased with the efficiency and reliability of the service; the number of calls, subscribers and wires handled by each operator has increased in a remarkable degree This is due to improved discipline, improved apparatus and to the gradual education and enlightenment of subscribers to the faults, frailties and imperfections of the telephone system; but while gratifying progress has been made much remains to be done, and more attention should be given to the well-grounded laws of electrical science in the fitting-up of offices, building of lines and the connecting of subscribers, to bring out all the capabilities of our business. We believe that the speedy transmission and dissemination of intelligence is one of the great problems of our modern civilization.

In the growth and centralization of population, the rapid demand for the extension of the telephone business and the fact that bad insulation and poor conductivity is not so apparent on short lines has tended to create plants that, in many instances, are as the log-huts of our forefathers to the palatial mansions of the present day; and as the old-time telegraphers look back with a smile on the crude efforts of their earlier days, so we, as old-time telephonists, will at no distant day be smiling at our present efforts.

When Titian was asked with what he mixed his colors to produce such marvelous effects, he replied, "With brains." Let us then mix brains and common sense with our work.

The microphone or transmitter teaches us the effect of imperfect joints; the telephone gives warning of the slightest disturbance in the electrical equilibrium of the circuit.

All connections should be soldered, particularly when made between different metals. The wires leading out and in to all buildings should be well insulated, and kept away from all probable dampness or other cause of injury. The

ground wires should be attended to, and looked after from time to time. Systematic inspection is imperatively necessary, and we think some small apparatus ought to be given the inspectors, say a simple galvanometer, that would determine the condition of the transmitter battery better than the visual signs. The insulation of the wires in offices needs looking after. The Chairman states that in one of his own offices he has found recently that the office cables had deteriorated to an extent that made good work an impossibility; and that when he ordered some new cable to replace it, he found it equally defective, and was consequently compelled to put in lead cables.

These last remarks may be considered a digression from the real subject of the Committee, but they are offered for what they are worth. Trusting you will find food for thought and study in these figures, the report is respectfully submitted for your consideration.

W. D. SARGENT,
Chairman.

THE PRESIDENT—Gentlemen, you have heard the report of the Committee. The question is on its adoption, and its being filed and printed. The Chair will consider that that motion is made. Will you offer your minds on the subject of the report?

MR. FAY—I would like to say that Mr. Sargent has struck one keynote of interest and importance in noting the number of uncompleted connections. This troubled us a great deal, and in the report which he read from the Chicago Exchange we showed a low average of uncompleted connections arising from a practice we have had of carrying over the connections, preserving the order of those connections, and completing them when we could get them. That is the effect of the drag of the subscriber on the exchange, and we have lately been working in the direction of putting this burden more and more on the subscriber. Our average shows about five per cent. of uncompleted connections. As a matter of fact, I think between twelve and thirteen per cent. belong to that class. The defective wires are comparatively small in number. I think that probably ninety out of every hundred of uncompleted connections result from busy wires alone, and that the uncompleted connections are particularly owing to the fact that some wires are very busy. For instance, the heavy railroad wires can generally be charged with half of the uncompleted connections. In

other words, they are busy all the time, and it is impossible for a man to call for a wire and get it, except by taking his turn. The drag of the subscriber on the exchange, however, is because he is slow in answering, and careless about doing his part of the work, ignorant of the way in which the machine works, hasty in making his calls, indistinct in his speech, or for some other similar reason, and he becomes an unmitigated nuisance in every way, except as a payer of rentals. We have lately undertaken the missionary work of converting him, and of making him more amenable to reason, of making him feel that he ought to know something about his machine, how to work it, and how to get the best results out of it. We have found that the heaviest users we have, make the smallest number of complaints in reference to the service of the telephone. They know how to use the telephone, and if they get into an exceptional condition, where the telephone will not work satisfactorily, they know how to get out of it. As I say, we have gone into the missionary service in that respect, and for that purpose we have four men going around the city of Chicago all the time teaching the subscribers how to operate the telephone. That has certainly been of great assistance to us. I simply mention that as a commentary on the remarks of Mr. Sargent.

MR. DURANT--I have a word which I want to say on this subject. First, I move that a vote of thanks be passed by this Association to Mr. Sargent for his very able report. Next, I want to apologize, not only to him, but to the Association generally, for not rendering him some assistance from St. Louis; but the fact is, that our system, being the Law, the material for a report is not at hand, and, in fact, it is impossible to gather the number of connections per day, or the number per operator, or the number per line, etc. I regret very much that I could not supply our very worthy and distinguished friend, Mr. Sargent, with the statistics from St. Louis, that would have enabled him more fully to formulate his information for the benefit of this Association. The remarks of Mr. Fay in regard to the education of

subscribers in the use of the telephone are very *apropos*. Of course, we have a great deal of that in the law system, and in the failure of subscribers to disconnect. I think that if we had a record of the failures of subscribers to disconnect, it would be found that seventy-five per cent. of our disturbances would be charged to that cause. The connecting capacity of the switch is generally about twenty seconds, where the machine is not defective. In investigating I found that subscribers did not disconnect as a rule, and I did as Mr. Fay did. I sent three or four men around on missionary work, and I have almost overcome that. I tried to gather some statistics as to the extent to which subscribers used their instruments, and was only able to do it for some weeks or so. I found in some cases that they average eighty per day. The Bank of Commerce averaged as high as twenty-two in an hour. They go to the instrument when their drafts come in, and, without disconnecting, call for the other banks. Of course, the operator is familiar with that kind of work, and without waiting for the formal disconnection goes through from one firm to another.

MR. DRAKE—I would like to inquire what trouble Mr. Sargent found in the Jersey City and Newark cables?

MR. SARGENT—The trouble was in the insulation. It was the ordinary cotton-covered office cable, fifty conductors. I have a few figures here that perhaps are interesting as showing the distribution of business. We keep, one day in the week, a very accurate record of the business in Brooklyn and Jersey City, showing the number of local connections, the number of New York connections, and the number of connections with each office, and from that we get the following results: The Brooklyn office, with 1,025 subscribers, has an average of 1,685 local connections daily; 332 to New York, 314 to the branch offices, which are Williamsburgh and Greenpoint, nine to the various offices on Long Island, and seven to the various offices in New Jersey, making a total of 2,347. The Williamsburgh office has 650 subscribers, and they make 1,665 local connections—226 connections with New York, 500 with Brooklyn and Green-

point, which are all the branch offices in Brooklyn, twenty to Long Island, and only two to the New Jersey division. Now, the Jersey City office has 400 subscribers, and is really the centre of a series of exchanges embracing about 1,850 subscribers. Jersey City has 760 local connections—160 to New York, sixty to Hoboken, twenty-one to New Jersey Division, and nine on the Long Island Division. In other words, out of these 400 subscribers, there are only twenty-one connections made with the 1,800 subscribers that are surrounding them. This shows that business between the various exchanges around the city of New York is practically nothing, and that it all tends into New York.

THE PRESIDENT—Gentlemen, will you offer your minds further upon the subject of the report of the Committee on the Central Office System and Exchange Statistics?

MR. DRAKE—The statistics of the calls made among the exchange subscribers is a very good feature of the reports. I would like to ask Mr. Sargent if he has the Omaha office report? There they have the figures kept correctly, and I think we can show a very much larger proportion of calls per subscriber, or calls during the day, than has yet been mentioned.

MR. DURANT—If that is a mistake on the part of the Committee, we can all increase it very rapidly.

MR. DRAKE—In the report of the calls made in the office in Omaha we gave an accurate account of the number of calls made, and the record is made of all calls from half-past six in the morning until seven o'clock at night.

MR. SARGENT—The Omaha report shows 535 subscribers, and the number of local connections made in 24 hours is 2,711; from eight A. M. to six P. M. 2,481, and the highest number in one hour is 313. There were no trunk connections reported.

MR. DRAKE—The trunk connections were reported, but in a different form. We did not understand your question as applying to trunk lines, and it was not included in this connection.

MR. SARGENT—That may have given us a wrong average

in these comparative details. We had to use a little judgment with some of the reports, because the offices did misunderstand some of the questions, and we had to try to put ourselves in their place as it were, try to reason the reports out, then put them in shape, according to the intention of the question.

THE PRESIDENT—I would like to ask Mr. Berthon if he has any exchange statistics which can give the Association any information, or if he has any record of the amount of business done by the telephone exchanges of France. If he has such information I am very sure that the Association would be very well pleased to hear it.

MR. BERTHON—I have not made the figures up; but I can probably state them from memory, at least, with tolerable accurateness.

THE PRESIDENT—That will do very nicely. If you can give us a general idea of the difference in the amount of the work done by the Frenchmen and the Yankees.

MR. BERTHON—The number of exchanges in Paris is 12, and the number of subscribers is about 3,563. The largest exchange is built for 1,000 numbers; there are four of 900, and the others are from 450 to 500, 600 and 700. We are, in fact, prepared for 7,000 subscribers in Paris; connections are about 24,000 per day in all the exchanges in Paris; an average of seven for each subscriber. Some subscribers call twenty or more times a day, and such subscribers it has been necessary for us to compel them to remain connected in a permanent way on direct call. They are subscribers who have two offices connected at the same central office, and often connected at two different offices through a trunk line.

THE PRESIDENT—You count one conversation as a connection? That is, if a subscriber calls the Central Office, and is by the Central Office connected with another subscriber, that is counted as one call? And when connected with a trunk line, that is one call?

MR. BERTHON—Yes, sir.

THE SECRETARY—Does not the effect of connecting the

annunciator across, as I understand it is in your system, reduce the efficiency of the talking?

MR. BERTHON—We have a resistance of about 200 ohms on each annunciator.

THE SECRETARY—That would only be one hundred ohms joint resistance. It seems to me that would shunt the circuit and reduce the talking capacity materially?

MR. BERTHON—No, sir, not the least.

MR. FAY—Are you using the same switch-board that you were using when I was in Paris, last year, where you had about twenty-five wires to each operator?

MR. BERTHON—Yes, sir.

MR. FAY—If you have to transfer part of the calls from one end of the switch-board to the other, for instance, the girl would have to put on one connection at the end of a horizontal radius, and then walk over and put on the other? Do you think an operator can handle more than twenty-five wires a day in that way?

MR. BERTHON—One operator will handle easily up to fifty subscribers, when we will get them to be called by the number of their instrument instead of being called by name, as we still do now, and also will use to a greater extent the system of direct call.

MR. FAY—I would like to ask the Secretary if he remembers the number of calls handled by an individual operator in one day?

THE SECRETARY—From 250 to 300.

THE PRESIDENT—Do the gentlemen of the Association desire to ask any further questions covering the French system? It is approaching the hour of adjournment.

MR. HALL—I would like to call the attention of the Association to one point which struck me very forcibly in the statistics, and that is the small number of connections per day per customer, and the trifling increase which has been shown from year to year where we have reports covering from three to four years. There seems to be a slight growth, but really a very little increase in the number per subscriber. This would indicate that perhaps we have

reached nearly our maximum growth very early in the business; or else it indicates that in the growth of the exchange system the service has not kept pace with the increase in the number of subscribers. We have more subscribers, having used our energy in that direction, increasing the number of customers but not increasing the average amount of service. I imagine, from the figures which have been given to us, that the number of calls per day is about five or six. When we think that we must have a wire maintained for that purpose, with a Central Office system for only one call in every four hours—and when we remember all the other matters incident to the proper keeping up of a telephone line, we must acknowledge that we are not rendering a very extensive service to the public. It seems to me that we have not reached the limit of efficiency in telephone service; that the needs of the public would not be and ought not to be confined to one call for every four hours; and that we ought to be doing something in that direction. Mr. Sargent struck the keynote when he said that we ought to pay more attention to the insulation of our wires and to the efficiency of our Central Office service. It may be that our efforts have been directed to more profitable channels, but in the coming year, I think we can wisely devote a good portion of our time in the direction which I have indicated, by doing the missionary work which Mr. Fay says has been done in Chicago, by educating the people in the uses of the telephone, and by other legitimate efforts in the same direction. In reference to adverse legislation, let me say that the more essential we can make the telephone to the public, the less liable we are to be hampered by such legislation. Make the telephone essential to the public, and they will support us in our efforts to keep up the service. I think, if the members will give a little consideration to that subject, and carefully and attentively look over the figures which have been presented, they will see that the growth of the business in the direction of the service of the exchange has not been commensurate with the growth in other directions.

MR. FAY—I would like to remark in that connection that I was Chairman of the Committee which had charge of that branch of the business for three or four years. Mr. Sargent has very acceptably succeeded me since, and I think he will bear me out in one suggestion, which is, that the first reports we got from the early exchanges were very strongly tinctured with an amount of brag. I think the statistics we are getting to-day from the various exchanges, are very much more reliable and accurate than they were three or four years ago. I know from my own personal experience, that when we first began to gather the records of those things we could not get an honest report from a telephone operator, and it gave a great deal of trouble and difficulty to the Committee who were trying to arrive at the exact state of facts with reference to that subject. We established a system of numbered checks, which cost a great deal of money, and we finally abandoned it on that ground; but during the time that we had it in force, it demonstrated that the operators reported about double the business they did. We could not get an honest account. I think a large portion of this apparent lack of increase can be explained by the fact that in the early exchanges reported we were furnished with an account of a great deal more business than was actually done. To-day they are reporting about what they are doing. I think every telephone manager knows that his business has very materially increased, that the service is better all the way through, and that he is doing more for his subscribers than he did at an early day. With many large houses we all know that the service is doubled, trebled, quadrupled, and even more than that, so that we have many telephones in use, whose connections are numbered by the hundred a day. The great majority of the public, the great majority of professional men, and the great majority of householders have perhaps only half a dozen, or eight, or ten errands per day, which would have to be done by word of mouth, and by leaving their own place of business, and going to the place of business of a correspondent, were it not for the instrumentality of the telephone, and we cannot expect any

man to create or use an unnecessary service; but I think that in the large exchanges the number of connections is proportionate to the business demands. Certainly, more than that cannot be expected. If every man in the city of New York could speak to a million or more telephones, still each man would only talk to his own correspondents, and I do not think that you can accuse the exchanges of inadequate or inefficient service, or of apathy, because as the number of subscribers doubles, the daily amount of service of each telephone does not double or treble. If it did, with our present facilities for service, it would simply swamp the business entirely.

MR. HALL—I think the statistics will also show that the number of subscribers has not doubled or trebled. As a matter of fact, the number of subscribers has not shown a remarkable rate of increase.

MR. FAY—It has been about ten per cent. a year.

MR. HALL—But that does not amount to double or treble?

MR. FAY—But it does since the first year that this Association started. For instance, I furnished the statistics of the number of subscribers the first year that we started, and the increase in the number can be very easily seen by comparing those statistics with the figures of the succeeding years.

MR. EASTABROOK—Then there is another thing; we must remember that we are catching the small users now. We started with the large users.

MR. HALL—Admit all that, and still I think that the telephone business as it stands to-day, with five or six calls a day for each station, is not what we have the right to expect as the maximum development. If we have reached the limit of our service in the direction of the large subscribers, and are operating only among the small parties, there ought still to be a field for improvement.

MR. BAILEY—Speaking of the advisability of having good central operators in order to improve the service, and do away with our troubles and dissensions, along with the uncom-

pleted connections, allow me to ask whether the trouble is only with the Central Office operators? Have not the bad operators who are placed about at the subscribers' places of business a great deal to do with the same cause, and what is this Association doing to improve them? This business is growing very rapidly, and, as is natural, we are all compelled to take up men and use them as inspectors. What are we doing to educate those men, our employees? I observe that in all large manufacturing establishments, in all large railroad companies and in everything of that kind, they have a set of rules covering the duties of the employees and instructing those employees in minute details all the way through. We have not done anything particularly in reference to that point. Can we expect to go out in the street and pick up a man who never saw a telephone and employ him as an inspector or as an operator, or in any capacity, and expect him to do good service? Why, it takes a long time to acquire the knowledge to make him capable of doing good work, and even when he does that he will pick up ideas of his own, and he is just as apt to get wrong as he is to get right. I did start out to make a set of rules for our people. I do not believe it is very hard to teach the general public the use of the telephone. If, when a subscriber comes to a telephone, he finds the instrument in good order, I think he will learn the use of the telephone very quickly; but it takes a great deal of education of the public in order that they may know not only what the troubles of the telephone are, but to learn to overcome them as an expert would. I claim that the public in general have no business to be experts. In other words, they pay for service and they expect it, and it is our place to furnish it.

MR. FAY—Let me say right here, that if a man becomes a subscriber to the Telephone Exchange, he must know how to use his instrument or he cannot get good work out of it. If he pays for a telephone, and uses it like a blockhead, he deserves bad service if he gets it.

MR. DURANT—Good service without the co-operation of subscribers is impossible.

THE PRESIDENT—The Association has been in session beyond the hour for its adjournment, and a motion to adjourn until to-morrow morning will be in order.

MR. METZGER—I move that the Association adjourn until to-morrow morning at 10 o'clock.

The motion was agreed to, and the Association adjourned until to morrow, Wednesday, September 17, 1884, at 10 o'clock A. M.

SECOND DAY'S PROCEEDINGS.

MORNING SESSION.

September 17, 1884, 10 o'clock A. M.

THE PRESIDENT—Gentleman of the Association, we will take up the business of the meeting where we left it last night, and continue the call of the Committees. The next Committee to be heard from is the Committee on Construction and Supplies. of which Mr. Wilson, of Chicago, is chairman.

MR. HOTCHKISS—Before we take up the report of that Committee I should like to nominate Mr. C. A. Cheever, of New York, as an honorary member of this Association. Mr. Cheever is a manufacturer of wires and cables.

THE PRESIDENT—Gentlemen, the nomination is before you ; will you agree to the motion?

The motion was unamiously agreed to.

THE PRESIDENT—The Chair has a communication from Messrs. Connolly Brothers, of this city, which he will read.

LAW OFFICES OF CONNOLLY BROTHERS,
PATENTS AND PATENT CAUSES,
PHILADELPHIA, September 17, 1884.

DEAR SIR—We tender you and the members of the National Telephone Association a cordial invitation to inspect, criticise and improve upon our *Automatic*

Telephone Switch, which will be set up for exhibition to-day at the Electrical Exposition.

As this invention has been productive of much controversy among telephone people, many of whom asserted it was impossible to effect what it proposed, and as it *does its work*, enabling subscribers to effect connection of their lines interchangeably, without personal or manual service at the Central Office, we feel confident that an inspection of it will be interesting to yourself and the members of the Association.

The location of the exhibit is in Section U 15, near B. & O. Telegraph Office, S. E. corner of Exposition Building.

Very respectfully,

CONNOLLY BROTHERS.

MORRIS F. TYLER, Esq., *President National Telegraph Exchange.*

The invitation is before you. I will ask the Secretary to acknowledge the receipt of the invitation to Messrs. Connolly Brothers. I suppose it requires no action of the Association. Is there anything further in the line of miscellaneous business to be brought up? If not, the Chair will call for the report of the Committee on Construction and Supplies. Is Mr. Wilson, of Chicago, in the room? If not, is Mr. Downs, of Boston, who is the next member of the Committee, present? Mr. Gifford, of Louisville, is also on the Committee. Is he here? Mr. Haskins, of Milwaukee, and Mr. Uline, of Albany, New York, are the other members of that Committee, but neither is in the room. I will pass that Committee for the present, and call for the report of the Committee on Cables, Subterranean Systems, and Electrical Disturbances. The Chairman of that Committee is Mr. Henry Metzger, of Pittsburgh, but I believe that the report is in the hands of Mr. Lockwood, of Boston.

MR. LOCKWOOD—Mr. President and gentlemen of the Convention: This Committee is, I believe, composed of five or six members. Mr. Metzger, who is chairman, has kindly permitted me to report, and I would say, that for one of the several members of the Association, I have met with better success in collecting materials for my report than the other committees seem to have done. Whether it be that aerial cables, buried wires and electrical disturbances have more general interest for the Association than statistics, than knowing how many times our operators breathe a minute,

or any such thing as that, I do not know. I simply would like to add one more remark, and that is, that I have sent out a series of questions to the Telephone Exchanges in the different large cities of the country, and every city with which I have communicated has responded; but I found out yesterday, as soon as I saw Mr. Durant, that I had totally omitted St. Louis from the list.

THE PRESIDENT—That is a small place.

MR. LOCKWOOD—The President says it is a small place, and perhaps it does not matter, but I mention it in order that I may say I have no personal animosity towards St. Louis or Mr. Durant. I would like to state, also, that I have apologized privately to that gentleman for the omission, and I have no doubt that in the remarks which I know he can make upon this subject, he will make up for any failure to recognize his city in this report.

THE PRESIDENT—Were you born in Chicago?

MR. LOCKWOOD—No, sir; but, with your permission, I will proceed to read this report.

THE PRESIDENT—The Association will be very happy to hear what you have to say.

Mr. Lockwood read the report of the Committee on Cables, Subterranean Systems and Electrical Disturbances, as follows:

REPORT OF COMMITTEE ON CABLES, SUBTERRANEAN SYSTEMS AND ELECTRICAL DISTURBANCES.

BOSTON, August 30, 1884.

AERIAL CABLES.

Nothing seems to have aided the telephone companies of the United States in their growth and development to a greater extent than aerial cables.

About two months since, one of the members of this committee (that is a modest way of pointing to myself), by way of finding information which might serve as a text for this report, sent a series of questions to a number of the principal cities of the country, and obtained responses, we believe, from all of them, which indicated, at least, that considerable interest was felt in the subject, and also that a good number of such cables were in existence.

The cities interviewed were Albany, Brooklyn, Baltimore, Boston, Buffalo, Cincinnati, Chicago, Detroit, Denver, Indianapolis, Louisville, Milwaukee, New York, New Haven, New Orleans, Providence, Philadelphia, Pittsburgh, San Francisco, and Washington.

I have arranged these cities alphabetically, so as to avoid any jealousy between themselves, which would otherwise obtain.

It was thought that these cities would afford a reliable index of the extent to which cables were utilized. Of the list above named, but one—Denver—has no aerial cables at all.

The questions propounded were the following :

1. How many aerial cables are there actually in use in your city?

2. What manufacturer's cables do you use, and how many of each have you in use?

3. What size of wires do you use as cable conductors, and if more than one size, what are they?

4. What anti-induction appliances are used in your cables, if any?

5. Give number of conductors in cables, and state how many cables of each number.

6. If cables of several manufacturers are in use, which style is most satisfactory?

When I come to that, I guess I will have to request the manufacturers, or their several representatives, to withdraw.

7. What method of suspension do you prefer?

8. What is the longest length of aerial cable you have in use?

9. Is much induction experienced between the wires of your cables?

10. If your cable conductors are of different sizes, have you noticed any size to be better than another? If so, what?

12. If you have cables of different numbers of conductors, have you noticed any special number to work better than others? If so, what?

13. Do you use lightning arresters at one or both ends of aerial cables?

14. Please give any additional information regarding cables which may occur to you.

We find by the replies that New York has the largest number of aerial cables in use, 175 ; San Francisco coming in a good second with 60, and Cincinnati an easy third with 43 ; Indianapolis has 2 ; Albany 3, and Pittsburgh 4.

The several manufacturers are much the same as heretofore, and rank as follows :

Out of a total, in the above cities, of 495 cables, it appears that 201 are Western Electric, 122 Phillips', 104 Day's Kerite, 18 Brooks's, Jr., 3 Clarke's; 25 are reported as miscellaneous, while 17 are unclassified. As regards the size of wire used as conductor, the maximum size reported is No. 18, and the minimum size No. 26.

Ten cities use more or less No. 26 gauge copper.

One uses No. 24, one No. 23, fourteen No. 22, ten No. 20, five No. 19, and five No. 18.

Referring to appliances for obviating inductive disturbances, the answers lead to the conclusion that 6 exchanges use a metal sheath enclosing the insulated conductors—said sheath leading to the ground.

Three exchanges use the central wire of the Patterson cable grounded externally.

Five exchanges use both of the above expedients.

Four report that they use no such devices ; these are Detroit, Milwaukee, Indianapolis and San Francisco ; and one, Cincinnati, makes no return.

Number of Conductors per Cable.

The number of conductors per cable varies from 150 to 7 ; 50 conductors is, however, the favorite number, since out of the total of 472 cables reported, 249 of them have 50 conductors each. Next in number comes the solid vote of San Francisco as a unit of 60 cables of 40 conductors each.

There seems to be considerable shyness about expressing preference for any special make or manufacturer, and the results in that line are so conflicting as to be almost worthless. Six exchanges only use one brand. One, while using several brands, dodges the question entirely. Three find all equally good. One, though using several brands, prefers Phillips' ; one prefers Clark as against Kerite ; one prefers Kerite as against the Western Electric ; six prefer Western Electric.

The manager at Denver wrote that he wanted to wait until he found out which was the best, and he hoped to find out at this meeting.

As a matter of fact we all like Mr. Phillips. So, too, we cannot say anything against Mr. Hotchkiss ; and we are afraid of hurting the feelings of both these gentlemen, while in the matter of the Western Electric Cable Company, as agent of the American Bell Telephone Company, which has some small interest in that company, everybody was afraid of saying anything about that to me.

Methods of Suspension.

These seem to vary as much as any other feature of the business.

Two exchanges use the Eckert & Seely sheet iron hanger, and another a modification of the same.

Three use marlin or bobbin hangers with No. 4 or 6 galvanized iron supporting wire ; in some cases, the marlin supports the cable by being wound round it in long spirals.

Five use large suspension wire No. 4 iron, or a strand of 7 No. 13 or 14 wires, and patent clips, by which I suppose is meant the " Wright" clip.

Two use heavy suspension wire and new style W. E. hangers.

Four use No. 4 or 6 steel suspension wire, and hang cable to it by wires twisted round it every two or three feet—two of the four first wrapping the cable with rubber, tarred tape or duck.

One exchange uses two or three strands of No. 6 wire—stretched tight and guyed. Cables ferried out on this and suspended by No. 10 wire hooks about two feet apart.

One has canvas slings hanging on 2 No. 6 wires, slings 2 feet apart ; and one uses wooden blocks gripping cable, with tie wire attached by hooks to suspending wire.

Length of Cables.

The longest cable reported boasts 5,395 feet, and is located at Boston—New York taking the second place with a cable of 5,280 feet, and Philadelphia third, with 4,350 feet.

Interference between Wire and Wire (that is Electrical Interferences).

Nearly all the reports state that but little induction or kindred trouble is noticed ; while but three or four seem to regard what trouble they have as being at all serious.

Size of Conductors.

I may say that since I have written this, I have made it a point to study the size of conductors, and I have been forced to consider the size of conductors as being most material, and I think that as a rule we have been using conductors which are much too small.

The question as to whether size of conductors affects transmission seems to be still undecided, although as will hereinafter appear we shall take occasion to comment thereon.

Six exchanges report only one size used.

One reports all of one brand as being one size, and all of another brand another size, comparison hence being valueless.

One exchange ignores the question entirely.

Two answer irrelevantly.

Five have noted no difference.

Two note marked difference in favor of larger wire. One says—all work well.

One axiomatically observes, " Large size conductors give best satisfaction on account of superior conductivity.

Number of Conductors.

Reports so far as they cover this question seem to indicate that the number of conductors is immaterial.

Eight exchanges report cables all containing the same number of conductors.

One gives no reply at all.

One says all w ork alike well.

Seven report not having noticed any difference, and one reports that cables of small number exhibit more disturbance between wire and wire, than those containing a large number.

Lightning arresters are generally employed at the outer ends of cables ; although Brooklyn, true to the early convictions of its General Manager, defies the fireworks of Nature, and dispenses with them altogether.

It is perfectly evident from the foregoing that aerial cables haye lost none of their popularity, that they are still regarded as being one of the aids whereby we may concentrate a large number of wires into a small space, and it would seem that their use, especially in the district immediately surrounding and converging upon the central office, might be increased.

We have no recommendation to make regarding the choice of manufacturers; we know too well on which side our bread is buttered, except that it is well for every buyer to profit by their own experience and that of the others.

At this late day, the general construction of the several cables on the market is

well known, and it is therefore unnecessary here to describe them. In purchasing a cable, attention should be given to the following points, which should be noted in the specification: Conductivity should be good; insulation high; mechanical construction, particularly as regards continuity of conductors, should be first-class.

I am afraid we have good reason to complain of some cables in that the joints are not made well.

The outside covering, or protecting coat, should be of a nature to resist the weather successfully.

The reports on the question of induction seem to indicate that this subject has become a minor one when compared with that of durability and perfect construction. But it is the opinion of the Committee that some form of appliance should still be used, either the well-known foil covering for ground connection, or the central wire of the Western Electric Co.

It is to be noted, however, that Chicago uses but few induction appliances, and Detroit none at all, while both exchanges report but little induction. It will of course be obvious to every gentleman here, who has studied the operation of cables, that when there is a large number of conductors in a cable, all of them closed up at both ends, whenever one wire is surrounded by others, the others virtually serve as an induction screen for the one, and thus, in a cable of forty or fifty conductors, having only one in use, we will hear a great deal of talk from one to the other; while, if we ground the others, or ground the whole bunch, the induction screen seems to be made. A notable instance of this was found at Pittsburgh, after Mr. Metzger had made his last series of cables. We made some tests with them, and found we could communicate from one to the other very successfully, but when we grounded the bunch of cables we found it was an absolute screen against any interference whatsoever.

It should not be forgotten that in cables with a large number of conductors, each insulated conductor is absolutely surrounded with a number of other insulated conductors, which thus form virtually an inductive sheath around the enclosed one. It will frequently be found that though the cross communication is very pronounced in a cable between any two wires, while the remaining wires are open or disconnected, it will be greatly subdued, when the surrounding wires are closed, or connected to earth at the ends.

The question of the best size for conductors is most important. As we have seen, the sizes used have been very indiscriminate—everything from 18 to 26 having been employed. We believe that there has been a great tendency to use sizes which are too small; and this tendency has been fostered by the heresy we have all heard so often—"that it makes no difference to the telephone how much resistance it has to work through."

Our copper wire experience shows that it makes a great deal of difference; and it is perfectly plain to us that it is the truest economy in the end, on account of the satisfactory results gained, to use a large wire conductor—No. 18 copper is none too large.

We are aware that it is, and will be objected to by many, no advantage to use a large cable, because a large wire is more sensitive to induction than a small one. We have not overlooked this point. It is true that the amount of induction between wire and wire depends, other conditions being complied with,

upon the extent of exposed surface—but we may increase the size of the wire, up to a certain point, advantageously, notwithstanding; for, while the surface increases in direct proportion to the diameter, the sectional area and, consequently, the conductivity quadruples when we double the diameter of the wire.

Another advantage resulting from the use of proportionally large conductors is the fact that insulation is much more easily and effectually maintained; and if we both use large conductors and have thick insulation, we shall, I think, obtain the best possible results.

We, therefore, have no hesitation in emphasizing the point that No. 18 should be the smallest wire used.

When we consider the number of conductors which should be included in one cable, two considerations present themselves: First, does the number of conductors affect the working? Second, does the number of conductors affect the durability?

It does not appear that the former point has been finally determined, except that it appears that there is a good deal of disturbance when very few conductors are used. It is our opinion, however, based upon careful thought and close observation of the electrical conditions, that neither an extremely large or an extremely small number is best. We believe the popular idea, in this instance (exemplified by the fact that the great proportion of the cables in use are 50 wire), to be correct. It would seem that a wire of the proper size can more readily be used and properly insulated, to make a cable of convenient size, when not more than fifty are grouped together; while, at the same time, we do not believe that a much smaller number is desirable, on account of the increased inductive effect which would accrue. As to the durability, we think that a fifty wire cable is still large enough; that better mechanical work can be obtained if not too many conductors are placed in one case; and, moreover, that it is not wise to trust too many lines to one common channel.

We have no recommendations to make in the matter of suspending cables, with the exception that we believe some form of clip which spreads over a large surface, is preferable to wire coils which are apt to cut into the cable.

We see no reason why more long cables should not be used, inasmuch as such cables afford a method of carrying a multitude of wires through a space, where although one wire might not be objected to, a hundred loose ones might be altogether barred out.

Notwithstanding the continued practice of our Brooklyn friend, we believe that lightning-arresters should still be used at the outer end of a cable, and also in the cupola—or testing house between the switch-board and line wire—only remarking that unless the ground-wire is of large size, and makes good earth, it is detrimental, and the entire arrester had better be dispensed with altogether.*

General Remarks.

Insulation in cables cannot be originally too high—or too uniform. It will depreciate quickly enough.

Climate should be also taken into consideration. In a country which has such

* Note by the Secretary.—All cables in Brooklyn are provided with lightning arresters at the outer ends. There are no lightning arresters in the Central Office.

extremes as ours—what may be perfectly efficient in St. Paul, may be worthless in New Orleans and *vice versa*. This is especially the case with the outside covering. On this subject we cite the remarks of Mr. C. H. Haskins, of Milwaukee, who may be regarded as an authority: "No cable covered with hemp, cloth or any fibrous material will withstand the storms of this climate (referring to Wisconsin)."

Even if the wires are perfectly insulated, the covering soon becomes ragged and gathers dust and moisture.

That is all I have to say on the subject of cables.

Underrground Systems.

As we heard yesterday, the State of New York has passed a law within the past year compelling the Electric Companies in New York and Brooklyn to lay their wires underground. We did not, and do not, regard this as being a fit subject for legislation, since we especially who are interested in the telephone know that there are many things which enter into the problem besides the mere mechanical arrangements and the maintenance of insulation. Dynamic and static induction, the latter manifesting itself as retardation, we have found to be the worst enemies of subterranean telephone communication.

That is to say, the question so far as we are concerned would seem to resolve itself into some such system as this: that if any individual or any corporation demands telephonic facilities, and, at the same time demands bad facilities, where we can give him or them good facilities, we must simply do what is demanded, let the consequences to him be what they may. If a man, for example, desires a telephone line stretched between two points, and he has the chance of stretching it in a direct line, at a low cost to himself, and also has a chance of stretching it in a circle of twenty miles, where one mile would do, at a cost of four times the expense of the other line, and insists upon making that circle of twenty miles instead of taking the direct line of one mile, we have nothing to do but to give him his choice, and let him pay for it. We can only give him the benefit of our knowledge and experience. If he declines to accept that and insists on having his own way, we must let him have it.

There is not much to report in the extension of underground wires. Boston has added a few more cables to its existing system.

Pittsburgh continues to extend, and has laid a large series of Patterson cables in the earth in wooden troughing filled in with pitch. These, so far as heard from, work well. Their durability will have to be tested by time. Washington has also laid a system of cables and covered wires in wooden troughing, but we have no reports as to the character of the results. I have no doubt that Mr. Berthon, if called upon, will favor us with some observations from France on that subject. In the Pittsburgh lines No. 18 copper wire has been used, and the talking through it is loud and clear. If this wire is used (and certainly for underground wires no smaller should be for a moment thought of), we get good conductivity, and if we make the insulation of each wire unusually thick, the tendency to retardation will be reduced.

We recommend, therefore, that in attempts to lay underground wires, no

smaller than No. 18 should be used, and that these should be insulated to a much thicker gauge—or separated from the other wires by a greater distance than in aerial cables. We have little to communicate as a committee upon this subject, and hope to learn something more from the individual members of the Association.

The personal opinion of this member of the Committee is that for private lines where not more than three or four wires are employed, or where the length is not over six or eight miles, and where the expense is not a consideration, the Waring cable might be employed.

Since this morning I have written the following:

Before concluding this subject, we believe that the Waring cable of the Standard Underground Electric Company, of Pittsburgh, demands a word.

This cable consists of a number of insulated conductors inclosed in a heavy envelope of lead, and usually of a rounded polygonal form. The conductors are each insulated with Ozite, a residual product of petroleum distillation.

Sweeping claims are made for the electrical properties of this cable, which is adapted in its present form exclusively for underground work.

It may be laid directly in the earth, or it may be laid in a box or conduit. It is said that no induction exists between its conductors, and that retardation between its conductors and the earth is unknown.

Up to the present time, but few conductors have been placed in each cable. The wall of lead round each conductor is consequently very heavy. The interference between wire and wire is indeed comparatively slight; it is, however, quite perceptible, and the slightness seems to be due to the heavy mass of the lead which appears to serve as a fairly effectual screen. As to the capacity of the cable and its freedom from retardation, the claims made are, in our opinion, quite too comprehensive. The retardation is much the same as that of other underground wires, and wherever it does not appear, it may safely be assumed that the cable has a pretty well defined amount of leakage.

The expense of the Waring cable is, however, so large, that it is beyond the reach of most telephone companies.

Its durability is still to be proved.

The Philadelphia City Council, June 13th, 1882, passed an ordinance requiring the removal of all telegraph, telephone and electric light wires from over, along or across the streets of Philadelphia prior to the 1st of January, 1885. On September 9th, 1884, a notice was served on the P. B. T. Co., that they would be required to comply with said ordinance, and requesting them to file with the Electric Department of the city plans for effecting said interment.

I have also cut the following remarks from a paper which I read this morning, one of the Philadelphia morning papers:

"UNDERGROUND WIRES PRACTICABLE."

I may say that this Committee completely agrees with that caption.

MR. SABIN—Did you say what paper that was in?

MR. LOCKWOOD—It was in the Philadelphia *Press*, I think. We coincide most emphatically with that heading. Underground wires are practicable, and to that we heartily agree; but we do dissent from any notion or any idea that

the word "practicable" means the same thing as the word "practical." We think that they are quite different in meaning, and we do not think that underground telegraph wires are to-day practical, except, as I said before, when a man is willing to pay four times the price for a wire which is only one-fourth as good.

This article is from the *Current*. I do not know what the *Current* is, but suppose it is some Chicago paper, and I may say that I expect Mr. Fay will cross-examine me very thoroughly before I am through with this branch of the subject. However, this is the article which I cut from the Philadelphia *Press* this morning:

"UNDREGROUND WIRES PRACTICABLE."

(*From the Current.*)

"The claim of the telephone and telegraph companies that no successful underground service has yet been secured, is absurd and untrue. The city of Chicago will, before the present month has passed, have its entire telegraphic outfit underground. Professor J. P. Barrett, the originator of the superb system of fire alarms first adopted by Chicago and now in use by the leading cities of America, has had miles of wires underground for years, and has operated such wires with ease and economy. A progressive spirit would in itself demand of the great corporations an end to the troubles which sleet, wind, conflagrations and vandalisms so frequently inflict upon electric communication. Now that the cities have begun the long-delayed reform, the companies will soon have to abate one of the most noticeable nuisances of our day and generation."

ELECTRICAL DISTURBANCES.

We have little new to report upon this subject. The disturbances on overhead lines are not regarded as much as they formerly were, except in the case of long lines in certain localities. The noises heard in telephone lines arise from many causes.

The buzzing, broiling and frying noises come from earth and atmospheric currents.

The Morse telegraph and telephonic cross-talk arises partly from induction, partly from surface leakage from wire to wire, over the cross-arms, and partly from ground wire leakage.

And magneto electric currents arising from the swinging of wires in proximity to other wires, also in east and west wires from swinging in the earth's magnetism. While experiments, which I have made for myself in the past year, lead me also to the idea that east and west wires are moreover subject to a cause of disturbance, which wires running north and south are not—that is, regarding the earth as a magnet, we know that each magnet throws its magnetic lines of force in a direction partly parallel with or at an angle to its axis. Therefore, the line of force of the earth will take one direction, and no other. It follows that line which runs east and west across its line of force. While one might think at first that the line being part of the earth and acting upon its revolution could not be affected by this force, we see at once that the wires being constantly blown about will have a magneto motion, and although one stretch of wires is not much, yet, when you multiply that by the number of stretches, we have quite an amount of induction subject to this influence. I do not know whether, if we had a wire long enough, we could not work a Connelly & McTighe lamp, and

I think that that is one cause of disturbance which we have overlooked. I do not know that the entire earth does not serve as a conductor for Siemen's armature.

We have no disposition to go over the entire ground that has been canvassed and recanvassed from year to year.

The several cable remedies of induction sheaths and wires in connection with the earth are still in use.

Claims are also made, that nothing in that line can be effectual except a combination of sheaths of paramagnetie and diamagnetic metal.

It is, however, pretty well ascertained that only by the use of the parallel metallic circuits, can long lines be at all times satisfactorily operated ; and it has therefore become a matter of invention to work such circuits economically, with our present system of single lines.

The situation looks very much as if we shall have to build special double lines for such subscribers as desire to communicate habitually over long lines.

There was a patent taken out by Mr. George Bliss, some time ago, which, if I had a blackboard, I could make quite clear, but which in the absence of a blackboard I shall have to attempt to describe. This was, in addition to the regular lines converging at the central office, to pass along, and not to run a second wire for each of those lines, but to run a wire around to all the ground terminals, to all the terminal stations of each of those lines. It was so arranged by switches that each ground wire could be taken from its own ground terminal, and switched around anywhere and returned to the central office, so that when any subscriber wanted to communicate with any city by means of the metallic circuit we could hitch this wire to the regular metallic circuit, by which means a metallic circuit, which could be used by every subscriber, could be supplied.

MR. SABIN—That would only help one at a time.

MR. LOCKWOOD—It would only help one at a time, but at the same time it could be used to some extent, I think, very profitably. At the present, it looks as if the only radical method of using the metallic circuit system for cities is to provide a complete wire circuit for every subscriber who thinks he will have enough use for it to pay for it.

When we say long lines here, we refer to lines over one hundred miles in length. It is believed that lines one hundred miles or less in length can readily be operated with a single wire, provided that first-class construction is effected, excellent ground wires used, soldered joints universally employed, wire of high conductivity, but not larger than No. 9 size used, and more attention paid to switch-board connections.

Where there are but two wires running parallel to one another, experience shows that they should be strung as far away from one another as possible, and wires should be stretched sufficiently tight so that they will have little or no lateral swing.

Very respectfully
For the Committee,
THOMAS D. LOCKWOOD.

THE PRESIDENT—Gentlemen of the Association, you have heard the report of the Committee on Cables, Subterranean Systems and Electrical Disturbances. A motion to

adopt the report, file it and order it printed, will be in order.

MR. SABIN—I move that the report be received, filed and ordered to be printed.

THE PRESIDENT—Gentlemen, you have heard the motion. Will you remark on the report? There ought to be gentlemen here of experience in the matter of cables, who could give us very valuable and interesting information.

MR. DURANT—I would like to ask Mr. Lockwood whether he knows of the experiment being tried of operating a metallic trunk line, with a single wire, and with an induction coil on each end of the metallic circuit?

MR. LOCKWOOD—In reply to the gentleman, I can say that I have not; but I know certain other people who have tried that experiment. I found out, two or three months ago, that it had been first invented in England, by a man named Bennett. I know that we tried it with Mr. Watson in the fall of 1879, and it worked reasonably well, although not well enough to commend it to practice. We found that there was a certain amount of loss in each induction coil, and also, that there was an amount of sluggishness in it, so that the words did not articulate so well after passing through the coil as they did before. In the long line we have between New York and Boston we found that the Hunning's transmitter works well enough at one end, but it does not seem to communicate readily from one end of the tube to the other, so that induction coils are not profitable so far as our experience has gone in that respect.

MR. KER—I would like to mention the fact that this system has been used between Manchester and Liverpool, in England, for years, with perfect success.

MR. FAY—Subsequent to the receipt of Mr. Lockwood's circular of inquiries, I had some experiences which I did not therefore communicate to him, but I thought it worth while to put them down in the form of a continuation of a paper that I read last year, and with the pleasure of the Convention I will read it.

THE PRESIDENT—We will be glad to hear from Mr. Fay.

Mr. Fay then read his paper, as follows:

OBSERVATIONS ON THE USE OF CABLES IN CITIES, BY MR. FAY.

To the National Telephone Exchange Association:

GENTLEMEN—Under the foregoing title I submitted a paper to the Association last year, which ended with the following, not over-confident conclusions:

"*First*—That a cable of many conductors requires no anti-induction shield; the mass of wires forming an induction shield sufficient to protect each individual wire.

"*Second*—That by using low resistance conductors the distance to which cables can be used satisfactorily, may perhaps be extended as far as is necessary for ordinary exchange purposes."

At the time these conclusions were questioned by one or two gentlemen, and I therefore wish to add the experiences of the past year to what I had previously observed in support of them.

I would say here, parenthetically, that Mr. Lockwood's conclusions this year are different from what I understood his opinion was at that time.

MR. LOCKWOOD—Yes, sir; I became a convert.

MR. FAY—And it was partly in answer to his opinion, as then expressed, that I wrote this paper.

We have extended and continued the use of cables by adding some ten cables, containing 1,000 conductors, to the amount then in use.

I would again say, parenthetically, that we use altogether cables of 100 conductors, and we have now some 2,000 conductors passing through cables, I think as large a number as any exchange except New York.

We have now two exchanges from which all the wires pass out through cables for a greater or less distance, averaging, perhaps, a thousand feet. These two offices are themselves connected by cables of 1,700 feet in length, and when connected to the cables passing through tunnels under the river, an aggregate length of something over 6,000 feet in cables may be attained. Through this distance these cables work with fair satisfaction; but we observe with each additional length of cable an increasing drag upon conversation, a deadening of the working of the transmitter, and a weakening in the volume of tone transmitted. The "cross-talk," or induction between wires, also increases to some extent, but is not so great as to prohibit conversation. As far as we can judge, it is principally derived from those portions of the circuits which lie outside of the cables.

We notice, as before, that the long country lines, terminating in cables, lose a large portion of their secondary (induced) currents after traversing the cable, and that these induced currents are very much stronger at the country end of the circuit, where they are forty miles from the cable, than at the cable end.

During the past year two systems of underground wires have been laid down

in Chicago, one by the Postal, and one by the Bankers and Merchants Telegraph Company. The Postal Telegraph Company's system consists of two 20 conductor Patterson lead cables, which are laid in what is known as the Sectional Electrical Underground Company's conduit. The conduit is nothing more than a square cast iron box, formed of short plates, any one of which can easily be detached so as to open the conduit at any point. The Patterson cables are made, I think, of No. 14 American gauge copper wire, and were intended for use by the Postal Company in connection with the Leggo Automatic and Gray Harmonic systems of telegraphy. As a matter of fact, the Leggo Automatic system has been little used, as I am credibly informed, and I have often seen the machines lying idle in the operating room. The Gray Harmonic system has been more used, but up to the date of my last information, they had succeeded in using but three tones; the fourth, or upper tone, was lost, as I understand, upon reaching the cable. I speak guardedly of this, because I derived my information from conversation with those engaged in working the line, and such information is apt to be erroneous.

I think it has been the experience of all of us that you cannot trust to what operators say. They oftentimes know that there are defects in the working of an apparatus, but they attribute those defects to entirely erroneous causes.

There is no doubt, however, of the following fact, that the induction between wires was so strong that but one conductor at a time could be used in each of these cables when connected with the Gray Harmonic System, on account of the interferences between the vibrations of the reeds on the different circuits.

There are two of those cables, each with twenty conductors, and when the Gray Harmonic Telegraph was connected to a wire in either cable, it could not be used on another wire in the same cable. It could, however, be used on a single wire in the other cable. Therefore, out of their forty conductors they could get two which were available for the use of the Gray Harmonic System.

One of our men tried these wires with a telephone. I did not try that experiment myself. They are about four and a half miles long. He obtained fair results, though rather muffled, as long as the other wires in the cable were silent. I am informed that there has been considerable difficulty in keeping these circuits in working order. I do not know what the nature of the difficulty was, but doubtless the manufacturers of the cable can explain that. They are present, I believe, and can give full information on that point.

The Bankers and Merchants Company laid down about thirteen miles of two and four inch cast iron pipe at a depth of about three feet below the surface of the city, with man-holes at distances of about three hundred feet. They hauled in kerite wires and cables into these pipes (the wires were No. 16 American gauge, about 90 lbs. copper to the mile), which were treated with a coating of asphalt so as to make them smooth.

MR. HOTCHKISS—Birmingham gauge.

MR. FAY—Was it Birmingham gauge?

MR. HOTCHKISS—Yes, sir.

The joints were made in the ordinary style of gas-pipe joints, and the pipes were fairly tight and well laid. They drew in about 150 miles of kerite wire, and this system ramified through various streets in the business portion of the city, and extended southward to the city limits. We tried these wires a distance of some four miles in connection with our lines to Michigan City, about seventy miles, and in comparison with open-air lines of different resistances from the city limits to the test-point, one copper wire (I am speaking now of the open-air wire) of about No. 12, American gauge (110 lbs. of copper to the mile), and also an iron wire of a resistance about equivalent to the kerite wire in the conduit. In talking over the underground wire to Michigan City, in the day time, we obtained conversation thick and muffled, and not, in my opinion, distinct enough for ordinary exchange service.

MR. LOCKWOD—How did the Michigan City conversation come to you?

MR. FAY—Very much the same way. I could not tell by my own end. I was not at the other end.

Conversation could be understood by an expert, but with ordinary subscribers it would not be good enough for commercial success.

Switching from the cable upon the over-head lines we had very good success, particularly upon the copper wire first mentioned. This line to Michigan City passes most of the distance through a swampy country, unsettled, and away from Morse lines, and is the clearest and best talking line we have out of Chicago. We were much troubled by induction from the Morse lines in the same cable. At night, when these wires and the roar of the city are silent, a tolerably fair volume of sound was transmitted through the cable, but it was still indistinct and muffled in comparison with the working of the open-air conductor.

I would say that there was a volume of sound transmitted in any case, but the difficulty that I observed was the indistinctness of articulation, which required practically a constant repetition of questions and answers. We would go on to the underground wire and have to ask a question two or three times over, and demand the answer two or three times over. Then we would go on to the over-head wire and get perfectly clear and satisfactory results. The test was a disappointment to me, because I had confidently calculated that on a wire of as low resistance as No. 15, we would have perfectly satisfactory results, and that we could go on putting our South Bend trunk-line under ground without much delay. We are very much cramped for wires running South. At the city limits we have not a wire which is not in use, and the prohibitory ordinance that has been in force in our city for the past four years prevents our running any overhead wires. I am a believer in underground wires since I went to Paris last year and examined the French system, and had expected and do expect to put down a considerable body of wires running under ground, and I was, therefore, considerably disappointed in not getting better results.

These tests were made by Mr. Jaques, of the American Bell, Mr. Hotchkiss and myself. Subsequently we tested a 20-mile Patterson cable, manufactured for the American Bell Company, by the Western Electric. This cable consisted of 20 conductors, some of 14, some of 18 and some of 22, American gauge copper wire. We tested it first in connection with the Exchange, and afterwards by itself.

The cable was still upon the reels in the basement of the Western Electric Company, one thousand feet upon each reel or drum, which made for the twenty miles one hundred drums altogether. The cables were connected together, from drum to drum, with the lead coverings, grounded here and there. I do not know whether the grounding occurred at every drum, or only occasionally, but they were certainly grounded a great many times throughout the entire length. All the wires upon which we were not talking, or the bunch of dead wires, was also grounded at each end.

MR. DURANT—Were those grounded at regular or irregular intervals?

MR. FAY—I do not know.

In the test with the exchange, there was in circuit the resistance of two clearing out annunciators, two telephones, and upon that the retardation of about 4,000 feet of our air cables. The drag of the exchange was very perceptible, and materially better results were achieved through the cable alone. But in both cases conversation through the No. 22 wire was almost inaudible; through the No. 18, better, but of no value for ordinary exchange purposes, and through the No. 14 still better, but not bright, strong, or satisfactory transmission.

CHICAGO, November 12, 1884.

A second test of these wires was made by me on the 12th of November, 1884. I used two underground Kerite wires, No. 15 B.W. G. copper conductor, for this test, and compared them with one No. 12 iron air wire and one No. 14 copper air wire, equivalent in resistance to a No. 6 iron wire. I obtained results very similar to those mentioned in the first test, except that the results were better. As far as I could judge this was owing to two causes: first, the fact that the Bankers and Merchants' wires have long been cut and in possession of the Sheriff, and the entire cessation of Morse business made them very clear and quiet, and free from induction. Second, the ground at each end and all connections with the telephone and transmitter had been carefully examined before testing, in order to get the best possible results. The underground wires talked fairly well from Madison street to the city limits, a distance of about four and a half miles, but they did not compare for distinctness of articulation with either the No. 12 iron wire or the copper wire. Sentences of words containing the letters "s" and "f" could not be transmitted without repeating over the underground line. Fully one-third of the sentences spoken over the underground line had to be repeated.

We also used two conductors at once, grounded at each end, thus doubling conductivity. The results obtained from those wires were not as good as those obtained from single wires, probably owing to the increased static capacity of the

insulating material. We also tried these two wires coupled up as a metallic circuit, and obtained better results than upon the single wires on account of the absence of induction.

These wires had been cut in five places and rejoined, and they acted as if they were grounded. A good ring of the magneto bell could be obtained over any one of them whether grounded or not. This made it difficult to estimate the effect of retardation.

C. N. FAY.

THE PRESIDENT—I would suggest that Mr. Fay be requested to furnish his paper to the Secretary, to be printed in proper form with the records of the Association. If there is no objection, that will be considered the sense of the Association. There is no objection, and it will be so considered.

MR. HOTCHKISS—I would like to ask Mr. Fay if he knew what further results Dr. Jaques obtained on the following day in testing the cables.

MR. FAY—Dr. Jaques stated to me the results which he had obtained in the afternoon or evening when I was present. Whether he tested on the following day or not I do not know, but he told me, in regard to the tests of the evening, that he got better results than he did in the day-time with the underground wires, although the results were still unsatisfactory as compared with the open-air wires.

MR. HOTCHKISS—The overhead wire contained about 110 pounds of copper to the mile.

MR. FAY—We used two wires, an iron wire and a copper wire. The best results were obtained on the copper wire, but the iron wire still gave good results.

MR. LOCKWOOD—Mr. Fay did not give his opinion on the point which I am about to state, but I am compelled to say that I do not think the value of a test of a long line of cables on reels is worth anything, because each convolution would certainly exercise its inducting and retarding effect upon each other convolution. However, the result of the experiment is certainly interesting, though I do not think it is as valuable as it would have been if the line had been stretched out at length. I should have said—and I ask the pardon of the Association for not mentioning it before—that all of us who have tried underground telephone wires

of any length must have noticed (and the result is also noticeable when a submarine cable reaches any length) that the retarding effect, as Mr. Fay observes, is much greater in incoming messages than it is in outgoing messages. Between New York and Morristown, Morristown can hear New York very well, but New York has much difficulty in hearing what is going on in Morristown. That is not new. It has long been known in connection with telegraphic circuits. It is known that in the Wheatstone circuits used in England the same result has been observed, and it is very annoying. Between Amsterdam and London there is a cable between the British coast and Amsterdam, and then there is a short line from the British coast to London. Now, London can work to Amsterdam quite fast, while Amsterdam has to work to London quite slow. In the one case the transmitting current has its work to do right close at hand, and it does it, and there is enough left to do efficient work over a long line. The residuary charge is dissipated before it has time to reach the receiving station. In the opposite station, however, there is a great deal of leakage on the working current of the long line, so that when it arrives at the cable it is enfeebled, and uses up its strength very rapidly. The way they overcome that in England is to put in a resistance without a magnetic core at the other end, so as to make the two overhead lines more nearly one. I do not know how it would work in telephone lines, but I think it might be profitably tried.

MR. FAY—In regard to Mr. Lockwood's remark as to the transmitting quality of the cable, whether coiled up, or stretched out on the ground, I may say that I carefully avoided, in the paper which I have read, expressing any opinion on that subject.

MR. LOCKWOOD—I know you did. I took particular notice of that.

MR. FAY—This question was turned over by Mr. Jaques and myself, and we both agreed that it worked very much better coiled up as it was, condenser fashion, than it would if stretched out on poles, or under ground. In regard to the

general subject of laying underground wires in cities, I would like, a little later on, to make some suggestions to the Convention, but, at present, while the question of transmission and the general working of underground wires is before us, I would like very much to hear from Mr. Berthon, of Paris, who has had more experience in that direction than any of us.

THE PRESIDENT—We will be very happy to hear anything that Mr. Berthon may suggest, and the Association will be indebted to him for any information he can give us on the subject.

MR. BERTHON—From the beginning we have started the Telephone Exchanges in Paris, with underground lines, providing every subscriber with a double conductor; that is to say, we had but very little hope that it should be ever possible to avoid entirely induction and cross-talk, except by using a complete metallic circuit. We have spent much time and money in searches and experiments of all kinds hoping to escape by some means from the metallic circuit, but none of them have been successful. For more than three years we have attempted to get along using our double conductor lines as one single conductor line, having both ends of the lines when connected grounded at the central office. We used also single wires for trunk lines, but we experienced so much induction and cross-talk, especially from the trunk lines, that we decided to duplicate at once the trunk lines, and since the 1st of January, 1883, we work one complete metallic circuit. I can say we are now completely free from all kinds of induction and cross-talk. It has put an end to the numerous complaints of our subscribers.

To reach subscribers outside of Paris, which are becoming from day to day more numerous, as we have had our concession renewed by the Government for another period of five years with the right of extending our business in certain limits outside of Paris, we necessarily prolong our lines on poles, but use a double conductor to give them the benefit of a service free from induction and cross-talk.

The Telegraph office and ourselves have been making

numerous experiments on long aerial and underground telegraph lines. The result was that good transmission of speech can only be obtained by using a complete metallic circuit and increasing the conductivity of the wires according to the distance.

THE PRESIDENT—May I ask you if your lines are underground, in the American sense, that is, if they are buried wires, or if they are wires hung in underground chambers?

MR. BERTHON—They are all hung in the sewers on hooks. We can put about fifty cables of fourteen wires on each hook, making 350 double conductors running in each sewer. They are all in lead pipes, and they are hung at the vault of the sewers. We have but very few underground cables that are laid in iron pipes for some short distances, where there are no sewers, not exceeding 100 or 300 metres at the most.

THE PRESIDENT—What is the size of the sewers in which your cables are hung?

MR. BERTHON—Most of the sewers are six feet high and three feet wide, but some sewers are much larger, that is, the sewers under the boulevards.

MR. LOCKWOOD—But all your sewers are large enough for a man to walk or creep through, are they not?

MR. BERTHON—Oh! you can walk through any of them. On one or both sides are the water pipes, and generally at the vault we lay our wires, and the place where we have to put our wires is designated by the Council of the city.

MR. FAY—What is there in the sewers besides your wires?

MR. BERTHON—All the telegraphic system is underground, and all the cables are so laid. There are besides water pipes, pneumatic tubes, and the wires for giving the hour in all the city. There are no electric lights in the sewers. They are not permitted, as yet.

THE PRESIDENT—Where are the wires for the electric light laid?

MR. BERTHON—What wires we have for electric light are laid in small pipes along the footways, but there is scarcely any electric light in Paris.

MR LOCKWOOD—What is the longest line you work out of Paris?

MR. BERTHON—Thirty miles. That is a metallic circuit, of course; but it is an overhead line. All our aerial lines out of Paris are laid with two wires. They are not noisy. There would be more noise on such wires if they were on the same poles with telegraph wires, of course; but we are not allowed to use the same poles in any circumstance. There would be no noise whatever by using cables on poles, the cables having a double twisting of their wires. Without the double twisting, having the wires exactly parallel as they are in telegraph cables, of course you get some induction. We recently talked on telegraph wires which are not twisted, having a metallic circuit. We got a little induction from the other wires of the same cable in which the telegraph worked. These wires were in buried cables in iron pipes. Our underground telegraph system has generally three cables in one iron pipe buried.

MR. FAY - Do they give a perfect insulation?

MR. BERTHON—The insulation was very perfect. Talking between Paris and Orleans, a distance of about eighty miles, the result was good; but it was not as satisfactory as we expected it to be, and it was but little better when we talked from Paris to Orleans, and talked from Paris to Paris going through Orleans, making one hundred and sixty miles return through the same pipes. It appears to me that in the latter case we got the talking by induction from the return circuit.

MR. FAY—Was that on metallic circuit, still?

MR. BERTHON—Yes, sir; it was on a metallic circuit.

THE PRESIDENT—Do I understand you that in your long lines running out of Paris you build all metallic circuits?

MR. BERTHON—Inside of Paris we build all metallic underground eircuits. Outside of Paris the underground circuits are prolongated on poles, also metallic circuit.

THE PRESIDENT—Are these lines of poles two parallel lines, or do I understand you that lines are insulated wires twisted?

MR. BERTHON—They are twisted in the cable, but are not twisted overhead.

MR. KER—I wish to ask Mr. Lockwood's opinion in reference to this matter of the twisting of lines, and its reference to the subject of induction. I know that on one occasion which came under my own observation there was a long wire not passing through an exchange, which went through a regular nest of telegraph wires, and the induction was so great that talking was impossible. They made a metallic circuit, and hung it on a screw, the poles being equidistant, so that there was a complete screw formed, and the distances in each case were equal. Then, that difficulty was overcome. I would like to ask whether open-air metallic circuits would not overbalance the induction.

MR. BERTHON—We have been trying some experiments that way, and it prevents the induction to a certain extent, but not completely.

MR. LOCKWOOD—That has been our experience. I think Mr. Durant tried that experiment, and expended a great deal of time and money upon it. Perhaps he can give us some information in reference to it.

MR. FAY—Mr. Preece, the Electrician of the British Postal Telegraph, showed me diagrams of their line, all of which were on that principle, the line made a quarter turn on each span. He used a two pin cross-arm, and made four turns with the wire. The first would be on the top pin, the next would be the right cross-arm of the pole, the next would be on the bottom pin, and the last would be on the cross-arm on the left hand side of the pole. He told me that that made a complete screw, and that it obviated the difficulty to some extent.

MR. LOCKWOOD—He told me the same thing.

MR. DURANT—We have a line between St. Louis and Belleville that is fourteen miles long, and on that we have cross-arms ten feet long, and on the outside pins of the arm we have on the one side a No. 9, and on the other side a No. 12 wire, but we have not been able to operate but one of those wires at a time. The first experiment was to place on the poles a No. 9 wire, and ground that every seven poles; but that had no perceptible effect. We then, for a distance

of seven miles, strung three additional wires, and cross-connected those wires every mile, so that no two wires ran parallel on the same section, and that had no perceptible effect; we were then in the same condition as we were when we started. We have three wires, but we cannot use but one of them at a time. The same experiment in cross-connections was made on the shorter line, composed of eight trunk lines, the line being about a mile and a half long, and the wires being in the same condition they were when we first cross-connected them. They have been in use for some time, but there is no relief from induction at all. We tried an experiment a little while ago, but unfortunately from some faults in the induction coil the experiment did not result as we thought it would. We have a line from St. Louis to Alton, 24 miles long, and we made the two wires run through one side of the induction coil, and on the other side grounded one end, while on the other end it was a single wire. We supposed we were working through an induction coil, but really we were working through one side of it and through a No. 9 wire, and we were elated at the results which we at first obtained, because we had just put up a No. 9 wire, and thought it would prove very satisfactory, but the next day, when we came to make some alterations in the switching, we found that we had misconnected it, and that instead of working through an induction coil, we had only been working on one side of it. Then we connected it properly, but the results obtained amounted to very little.

THE PRESIDENT—In other words, when you connected it right, it got wrong; and when you connected it wrong, it worked.

MR. DURANT—That seemed to be about the effect of it.

MR. DRAKE—I do not know that I can add anything which will be of value to the Association in reference to this subject, but it reminds me that we had two wires between Omaha and Lincoln, the Capitol of our State, on the same line, which was about seventy miles long. The first wire was No. 10, and the second wire, which is placed about three

and a half feet below it, is a No. 14½ steel wire. We have three stations between the two cities. We use a No. 10 wire for the through line, and we use the No. 14½ steel wire for communication between those stations, and we put a push-button on each side of the pole at those new stations, so that when they are talking they can be connected with the station. We have also found that we can use both wires, to some extent, at the same time. Of course, there is some interference, but it is not material. Our subscribers talk over the through line, while intermediate stations are using the small wire very satisfactorily. Sometimes it is better than at other times. We cannot always use both lines at the same time, but we find that we can make a double use of the second wire while the through wire is being used. There are no other wires on the line.

THE PRESIDENT—In what direction does it run, north south, east or west?

MR. DRAKE—It runs southwest and northeast, that is in Nebraska. We have another line that runs in a northwest direction, and then angles and runs northeast. That line is forty miles long, and we have worse results on that line than on any other. I would like to ask Mr. Lockwood, or some other electrician, if they have noticed a similar effect on lines in similar places, or on lines run in the same direction. The voice is weak and retarded. We have another line, running west, about forty miles.

MR. LOCKWOOD—Is the line noisy?

MR. DRAKE—No, it is not noisy, except from the ordinary atmospheric disturbances. We have another line running west about forty miles, which is a very plain line to talk over.

MR. LOCKWOOD—I do not think I can give you any satisfactory answer to your question. I know that such things exist, but why they are so I cannot tell.

THE PRESIDENT—Are the lines all alike in their construction?

MR. DRAKE—They are all alike in their construction. We have another wire, fifty-three miles long, and over forty miles

of that distance the talk is as well as on any ordinary exchange line; but this peculiarity of the line running to the northwest first, and then angling and running to the northeast, is something that has puzzled us considerably. I would like to hear from any any gentleman who has had a similar experience.

THE PRESIDENT—Can any one give Mr. Drake any information on that subject?

MR. SABIN—I do not know that I can give him any information on that point; but we have no trouble in working on the same poles. For instance we start from San Francisco to the ferry, seven miles, then we have a cable for another seven miles, and we use that all the time. The railroad uses three, and we use one to Oakland, and we use three to Benicia. There are 4,500 feet of cable there. Then we have two wires for getting to Sacramento, sixty-five miles, on the same poles, and all those poles have eight-foot cross-arms, paraffine pins, glass insulators, and ground wire on every pole. We are working one of the wires to Sacramento, and at the same time we work the other wires to Benicia, and work the way wire at the same time; and although there is cross-talking, the subscribers go right ahead, and go right along with their business. Working through that cable, it is about ninety-five or one hundred miles to Sacramento, Sacramento works pretty hard. We use the Edison telephone entirely for those long lines. We cannot use the Blake at all, between San Francisco and Sacramento, but with the Edison, with three cells, we have no trouble on the part of those who want to work.

MR. LOCKWOOD - How do you give them to your subscribers?

MR. SABIN— We give the Edison telephone to the subscribers in San Francisco, that is, to those subscribers who have large business, and also from San Francisco to San Jose, which is about fifty miles. Then we have a wire from Santa Cruz to Watsonville, 105 miles. Now they use that wire, and at the same time they are working the way wire between Watsonville and Santa Cruz, and working the way line from

Santa Cruz to Sacramento. Of course, there is induction on those wires, and you can hear other parties talking; but if you want to go ahead and do your own talking, there is no trouble about it.

THE PRESIDENT—Your own talking is heavier, I suppose?

MR. SABIN—I suppose it is.

MR. JACKSON—Do you ever use the Blake transmitter?

MR. SABIN—No, sir.

MR. LOCKWOOD—Do you put your wires up with lightning guards?

MR. SABIN—No, sir; we do not have lightning.

MR. DURANT—Does anybody know of any experiments having been made with the Delany Duplex or Multiplex on telephone lines, long lines? It has occurred to me that there is a possibility of our having a relief from some of our difficulty in that manner.

MR. LOCKWOOD—It has occurred to some other gentlemen, Mr. Jaques, of our Company, particularly. I do not think it can be done. I have taken some pains to study the multiplex, and at the request of Mr. Duxbury, I took occasion to see what the effect of the induction would be on the multiplex; but I will not attempt to explain it. I do not know whether it would have any effect in remedying the difficulties which have been suggested, or not. If the multiplex wire is in any very near proximity to a telephone wire, the noise is simply appalling. I do not think it is possible to make a synchronous motion go fast enough to be used as a telephone transmitter. We might introduce a ground connection and relieve the wire of the static embarrassment, and might work a long line in that way.

MR. DURANT—That has a different connection.

MR. LOCKWOOD—It has a different connection, but there are breaks constantly. Still, it is a subject for information and experiment.

MR. DURANT—I hope some of the gentlemen who have the opportunity will try the experiment.

THE PRESIDENT—Has any other gentleman anything to

remark on the subject of the report of the Committee on Cables, Subterranean Systems, and Electrical Disturbances?

MR. FAY—Before we altogether leave the subject of cables, and particularly underground systems, which I have very deeply at heart, I want to ask Mr. Berthon one question, and then follow it with a few remarks, that is, whether he has noticed, or has reason to expect any difference in the working of underground cables when laid directly in contact with the earth, or when carried in sewers as they are in Paris?

MR. BERTHON—I think there would be a great difference between cables when laid in the earth and when laid in sewers. The retardation is very much greater when a cable is laid in the earth than when laid in chambers or sewers. It is very much less if they are laid overhead.

MR. FAY—That brings out the point I want to make, which I think is of interest to people who operate telephones in large cities. I think there is no doubt that the opposition of people to poles in streets is a permanent one, and will not disappear. I think there is no doubt in the minds of telephone managers that for large bodies of wires it is desirable to lay them underground, if it can be done, but the movement ought to go no further than common sense demands. For instance, in every city there are magnificently improved thoroughfares that ought to be cleared of obstructions in the way of poles and wires, from an æsthetic point of view, if you choose, if for no other reason. But, at the same time, there are neighborhoods which are utterly squalid, miserable and dirty, and there is no reason why poles and wires should not be stretched in those streets. There are distant portions of every city which, if reached by underground wires, would be so expensive as to place an embargo on the business, and deprive the inhabitants of those regions of telephonic facilities. Therefore, it seems to me manifest that the efforts of the Association in the communities which are subject to this predicament should be to create a modified system, and to create a modified public opinion which would permit of the placing of wires underground where

it can be done to advantage, and, at the same time, retaining the overhead wires, where they are necessary economically. For myself, I have thought out a simple system, which probably every manager here has been trying to establish—that of overhead cables for the short subscribers' lines in the thickly built districts in a city, and of underground cables for trunk lines having no private lines, and for the longest subscribers' wires ; and though there are few in those districts which could be placed in conduits and made a permanent underground system, yet I think that the attention of the public and the municipalities and the State Legislatures ought to be directed to the fact that they cannot restrict the facilities of the citizens in their business, or in their interest in the protection of telephone enterprises, and in the enabling of telephone companies to give to any man the right to use a telephone for a fair and just compensation; and, to that end, these authorities ought to be led to consider a modified system. What is for our interest is, I think, in general, for the public interest also. We can put down our trunk lines for a distance of a mile, or two miles, or perhaps three or four miles, if, as I said before, we use sufficient conductivity, and thus get our heavy masses of wires out of our way, to our own great comfort and the beautification of the streets of our cities ; and we can also make arrangements with property owners for the maintenance of overhead cables for our short telephone lines. As the aerial exchanges are situated in districts where there are naturally a number of telephones gathered closely together, we must pay special attention to them. Oftentimes we have routes of wires that leave the office two or three hundred strong, and disappear entirely before they have gone two or three blocks. It is absurd to talk of putting wires like those underground. You no sooner get underground than you want to get out again. The mode of running those wires, in my opinion, is to make central stations in each block, if necessary, or one for every two or three blocks lying contiguous, and to connect the subscribers' stations to those central stations. That is, I call those stations cable termi-

nals, and I desire to connect them with cable wires. They are cheap; they are not visible in the neighborhood which they occupy; they cross the streets at a height of 100 feet or more, and nobody cares anything about them. I would connect those cables with the Central Office by cables of 50 or 100 wires, which likewise cross the street at a height of 100 feet, one perhaps in every five or six blocks. They are not noticed by the public, and do not interfere with the property owners. As an instance of how little they are noticed by property owners, I may state that in the city of Chicago we have placed something like 200 aerial cables, and the work has been done so quietly that it has not even been noticed in the newspapers. It has not even been commented upon by any person whatever, unless one of our own men has personally called attention to it. Therefore, it seems to me that the proper move for us to make is to act in the direction which I have indicated. I think my sytem is the correct one; but if any system can be devised which will meet the exigency, and which will instruct public opinion in that direction, I will be very happy to hear it. We have (in Chicago) what is known as a Citizens' Association, which is a self-elected and self-created body, which has a regular organization, a permanent Secretary, and numerous committees, whose function it is to deal with all the abuses which can be corrected by legislation. They inquire into questions of sewage, into questions of police service, sanitary matters, regulations in regard to building, and all such things as that. They make reports which are printed every year, and which are distributed to the people, published in the newspapers, and which undoubtedly have a great deal of influence upon public opinion. The gentlemen composing the Association are all responsible men. Most of them are large property owners, and their opinion is of weight on any subject. Now, that Association asked for a conference with the telephone, telegraph and electrical people of the city of Chicago, we met them, and we started out with a scheme substantially the same as I have proposed here, and they approved it at once. Unless

the city government is willing to go to the enormous expense of constructing underground channels similar to those in Paris, I do not see how it is possible to lay our wires underground and furnish our subscribers with telephonic service, unless at a price which would practically preclude the people from enjoying the benefits of the telephonic system. If the city government were to do so, then I would say, "We will welcome these channels of communication, and make use of them at once," but our city government has not the funds to pay for such an enterprise, and our city is too near the water level of the lake to permit of such a system being carried out, even if it was proposed. In addition to that, the temper of our city government is adverse to any such experiment, and, therefore, we can do nothing except remain as we are, and do the best we can under the circumstances.

THE PRESIDENT—And trust to Providence.

MR. FAY—I trust to the intelligent sense of the people of our community. I have spoken only with reference to Chicago, but the same is true of every city in this country. There is no city in the United States that has an adequate system of sub-ways, or is likely to have. Under the circumstances, what can we do? If we have to face the underground question at all, we must do it in a common-sense way.

MR. DURANT—Following Mr. Fay in the same line of thought, I might say that we have had some experience in the city of St. Louis, on the same subject, which it might be profitable to present to this Association. We, certainly, have to meet these questions as they arise. The question of underground wires will not disappear, but there is a question of policy which we must consider. The rules and requirements adopted by the Board of Public Improvement were referred to here yesterday, and it might seem that they were instigated in a spirit of antagonism, against the telephonic system. Such, however, is not the case, and if this Association will analyze them, it will find that from their standpoint what they have submitted is a very fair proposi-

tion, and that all the companies are treated alike. The President of the Board of Public Improvements has officially stated that his desire was to have subterranean lines for telegraphic and telephonic purposes, but that he is convinced it is at present impracticable, and that now every encouragement should be given to those companies for overhead wires for at least ten years, when it may be that the companies will have developed their business to such an extent that they can tell what will be wanted in the way of a subterranean system. He asked me what system I had to suggest that would permit of the laying of telegraph and telephone cables underground, and I told him that my idea was to have a sub-way under the streets of the city large enough for a man to go through. He told me that he agreed with me in that suggestion, and thought it was the only proper system, and he said that he had calculated the cost of one hundred miles of suitable sub-ways in St. Louis, and that it amounted to some four millions of dollars. Of course, with that sum staring the public in the face as the deliberate calculation of the President of the Board of Public Improvements, a practical man, and an engineer entirely competent to give an intelligent judgment upon the subject, I do not see that we have any hope of seeing any subterranean system in St. Louis for some time to come. Of course, the resolutions formulated by that Board upon the subject have been such as other similar Boards would adopt, but I think we can get along.

THE PRESIDENT—The underground system has arisen in Washington with more vigor than anywhere else, because Washington is not a city under civil government, but is a city under military government. The three Commissioners say, "Do this!" and if it is not done, something happens; and if you do do it, something else happens. The result of the action of the Government there has been that the Chesapeake and Potomac Telephone Company, on applying for permission to increase its cable facilities in one direction from its office, was met by the paternal injunction to put that line underground at once. There was no question as to whether it could be done, or whether it would be worth

anything when it was done. We wanted to hang one hundred conductors, and some of them, on that line, we had partly up, when we were told not only to stop hanging them, but to take it down, and to take the old one down too, and bury the whole thing. We buried it, and for some distance it has worked pretty well; but this system which Mr. Fay suggests, of lines for large cities, is substantially the system upon which the District Commissioners in Washington have settled as the way to solve the underground problem there. As you all know, Washington is a city of fine avenues, and also of small streets and alleys. We have a line running from our Central Office through D street, which is one of the most improved routes in the city, connecting with the whole of the south-eastern business portion of the city. That line was standing when I was there, and I think it was standing when Mr. Bryan lived there, but how long it will stand no one knows. We are told that before that line gets ready to fall down, it must go underground; but we are getting the terminals of our heavy trunk lines, and pole rights through the alleys, to almost any extent we desire, and they meet the difficulty in that way, not expecting us to put all our wires underground, but expecting us to do so in the principal streets, and that in those streets overhead wires from our main office shall disappear. I would like to have Mr. Bryan state just what is being done in Washington in this matter. He can give details which I cannot.

MR. BRYAN—In the matter of underground wires in Washington there has not been a great deal done. We have one line of underground on which the longest cable is about 3,000 feet. We started out of the Exchange with 450 conductors in cables about equally divided between the Phillips Cable and the Western Electric. In the second block from the Exchange we ran a cable into an alley and distributed it, and we do that on about every alternate block until we get to the terminal point of the underground work. Such of those conductors as we are working are working well, and in talking from my house, over a cable which is connected through the entire 3,000 feet, to the Exchange in Baltimore, I found no

difference between talking on that wire and talking through an overhead wire. The great D street trouble, upon which Mr. Tyler has just been enlightening you, is something which has to be grappled with pretty soon. It is a line about 6,000 feet in length, and the proposition is to start out of the Exchange with 700 conductors, and distribute them on both sides, running under the sidewalks, as far as possible, with cables, and distributing them on the alleys in every block where we have from two to four distributing poles. These, we have the permission of the city to erect, and we propose to put them up in such a way that they will tap the lines already constructed, and so we will have all the facilities in that direction we want. It is also proposed to build a line underground westerly from the Exchange, going through the public grounds, and also another line to the southward, toward the Smithsonian Institute. There has been considerable difficulty in getting pole rights, unless we promise to go underground, but with profuse promises in that direction we have got all that we want. The Commissioners now propose to give us all the pole rights we want, and in the outlying parts of the city they propose to give us poles in the streets, and not confine us to alleys were we have to use a sixty feet pole, when, perhaps, a thirty feet pole would answer the purpose.

MR. FAY—Did you put down the Hurlbut system?

MR. BRYAN—No, sir; the Postal Telegraph Company adopted that system. It does not work well. I am informed by the Superintendent of the Baltimore and Ohio Company, who used it, that it does not work satisfactorily at all. We use nothing but Paterson's and Phillips'.

MR. KER—I would like to ask Mr. Bryan whether he has formed any opinion as to the difference in cost between that 3,000 feet of underground cable and overhead working?

MR. BRYAN—The difference would be the cost of putting up overhead work and the cost of laying down a cable for the same distance. The cable that we laid underground was a very expensive one. There were a great many mistakes made in it, as it was our first attempt. We have fig-

ured at it since, and have found that we can put down cables about thirty per cent. cheaper than we put down this one, that is, the same kind of cable. We do not propose to put any other cable down with the small conductors that we put there. There, we did not use anything larger than 22.

MR. KER—But, as I understand, you have not formed any opinion as to the difference of cost between the overhead and the underground working?

MR. BRYAN—No, sir; I did not work that out. It could, of course, be done without much trouble.

MR. DURANT—How deep in the street did you put the cable?

MR. BRYAN—We did not lay them in the street, but along the sidewalk, and we tried to get below the frost line.

MR. DURANT—Are there any vaults which you can go through?

MR. BRYAN—There are no vaults of any size. If we cannot go through on the sidewalk, we go around. We are promised immunity from interference on the part of the property holders and from the District authorities, and I think we will get along all right.

MR. METZGER—It has been my fortune for some years back to give considerable attention to the laying of underground wires, and probably, to-day, so far as the telephonic interest is concerned, Pittsburgh has more underground wires than any city in the Union. In 1881, owing to the avariciousness of a landlord, who required the Company to pay for the use of his roof the modest sum of $5,000, I felt myself compelled to lay some underground wires. I started with three Patterson, No. 26 copper, 50 conductor cables. I ran those cables underground in a wooden box, covered over with pitch, or asphalt, to a pole, for a distance of 1,000 feet. From there they were radiated to various parts of the city that were contiguous, being on lines fifteen or twenty miles long, and being worked through those cables. Those cables have now been worked for three years, and so far as the underground part of it is concerned, it has not cost the Com-

pany a five cent piece. A portion of those cables used single wires, run through cleats, starting from the Central Office, and working from that point directly to the office of the subscriber, all underground. That is to say, we laid the boxes along the curb of the street, and as we came to each house, we took out one, two, three, four or five, or any other number of wires that we thought they would require, and ran them into the vault of the building, and then connected them up. In some houses we have as high as eight telephones connected upon this underground plan.

The succeeding year, I laid eight Patterson cables of fifty wires, running a distance of 1,200, 600, 1,600, and 2,200 feet, and then took out one, two, three, four, five, or six of those cables, as they were required, and ran them to poles, and radiated them out in that manner. The other three cables ran precisely in the same way, that is to say, we ran to an intersection of the street, and then radiated from that point by single office wires run through these cleats into the various buildings, as we went on.

Then I laid eight more, with a capacity of four hundred wires, of No. 18 copper wire, for a short distance, and with respect to them we pursued the same plan as I have before mentioned, that is, running the cable to a terminal point, and radiating that into vaults and into offices. When we got beyond that point, we ran to poles, and radiated from them. The cables that we laid this season have worked much better than the cables that were laid down originally, but that, I believe, is owing entirely to the fact that the wire is a larger wire and of better conductivity. However, my views in regard to underground wires have been so fully expressed by Mr. Lockwood, that I need have nothing further to say on the subject, except that I would like to suggest to the Association that it would be a wise thing for the members in every city to provide themselves with the franchise of going underground. I started that in 1881, and I obtained a franchise under a separate and distinct name, not belonging to our Company at all, but I obtained it in the name of a separate and distinct Company. I think it was a

wise move, and I think it will be a wise move on the part of those members who represent large cities to do the same thing, and get the franchise to put the wires underground.

MR. SABIN—Have you the mileage of that underground system?

MR. METZGER—No, sir; I did not count it. We have about 600 wires working underground, but, of course, we have a great many surplus wires which are not in use.

THE PRESIDENT—Have any of those underground conductors given way?

MR. METZGER—Very few; I think only one or two instances, and they were in the first of the cables which we laid.

THE PRESIDENT—Have the conductors which have given out, been in cables, or were they separate?

MR. METZGER—They were in cables.

THE PRESIDENT—And I understand you to say that your cleat wires have not troubled you?

MR. METZGER—No, sir. They work to-day as well as they ever did.

MR. FAY—If you had to put nine wires in a building, how would you get that other wire in?

MR. METZGER—I have not tried that. We put all the wires in that we could get in. The last cable I laid I ran to a pole, so as to utilize every wire there was in that cable.

MR. FAY—I asked that question, because it was my idea to put an underground cable into a building clear through, or to go to a pole or a terminal station near by. There is another point about which I wish to ask you. Your building is fire-proof, is it not?

MR. METZGER—It is said to be.

MR. FAY—Suppose you would be cleaned out by fire, what would you do with your terminals?

MR. METZGER—Simply extend them, and take them out of our vault.

MR. FAY—It would be a pretty slow piece of business, would it not?

MR. METZGER—It would not be any more slow than if the general office burned down.

MR. FAY—It struck me that if I could not get a fire-proof building for my Exchange, I would not run my underground terminals within say 200 feet of the building, but terminate them out in the street and in chambers at a sufficient distance away, and connect them by overhead cables into the operating room. Then, if such a building as that were destroyed by fire, you could take these overhead cables, which would be flexible ones, and twist them around in a day.

MR. BERTHON—I might add that we are using now a system of underground cables, insulated with oxydized oil. We have been experimenting with them for several months, and the results have been quite satisfactory. Such cables can bear heat, which is a great advantage when cables have to be laid in sewers where we have hot water from the condensing of engines. It is a new process, that will probably be known to the members as the process of MM. Berthoud and Borel. The insulation is very good, and the retardation very little in such cables, much less than in a cable covered with gutta-percha or rubber.

I shall mention, also, that, in our exchanges in small towns, where we use a single wire, to overcome induction we use the Gower cable. It is a wire insulated with gutta-percha and wrapped with cotton and tar, and surrounded with a tinned iron spiral. This cable gives less induction than any other insulated wire. They are laid underground in small cement pipes. Mr. Gower thinks he gets less induction on account of the iron spiral that surrounds the covering. I consider it a very good and cheap cable when you cannot use a complete metallic circuit, and have to lay the wires underground in small pipes.

THE PRESIDENT—Is there anything further which any gentleman of the Association desires to remark on this subject? If there is nothing further to be offered on the subject of Mr. Lockwood's report, we will pass it, and I will ask if any one in the room is a member of the Committee on Construction and Supplies. Mr. Wilson, of Chicago, is the Chairman of that Committee; but he is not here. I saw Mr. Downs, of Boston, who is the second member of the Com-

mittee, in the room a little while ago. Is he here now, or is that Committee ready to report? The Chair hears no response to his question, and that Committee probably has no report. At any rate, I will pass the subject for the present. If the Committee has a report, it can be presented and considered at a later period of our proceeding. Mr. Fay informs me that Mr. Knight wishes to offer a suggestion on the subject of wire, and this would probably be a very good place for it. If Mr. Knight is in the room, the Association will be very happy to hear anything he may have to offer on the subject of wire. Mr. Knight does not seem to be present.

MR. FAY—I think I can state the substance of Mr. Knight's communication, and I certainly think it is well worth the consideration of this meeting. As we all know, he represents the Palmer Wire Co., of Palmer, Mass., and he offers the suggestion that the Association should make some movement toward the establishment of a uniform wire gauge for all the wire drawn in the country. He thinks the only way to secure a uniform drawing of wire, and a standard gauge in that respect, is for the buyers of wire to insist upon a standard, and to make their specifications calling for these standard sizes. At present, the sizes at which wire is drawn are of substantially no gauge whatever. We have the old Birmingham gauge, and the old American gauge, differing in size, and the new gauges of the copper wires that we are using so largely, being neither one nor the other, make it very confusing. I think the suggestion is well worthy of attention, and in order to bring it legitimately before the Association, I move that a committee of three be appointed to suggest standard sizes of wire. We cannot enforce any standard we suggest, but we can make the suggestion as to what we think ought to be the standards of the Association, and it may be productive of good.

THE PRESIDENT—Gentlemen, you have heard the suggestion of Mr. Fay, which is that a committee of three be appointed to suggest standards of wire gauge, which shall be considered the standards of the Association. Is the motion seconded?

MR. SABIN—I second the motion; I think it a very good suggestion.

THE PRESIDENT—Gentlemen, will you offer your minds on the question, or are you ready for a vote? As many as are ready to pass it to a vote will express their minds in that direction by saying, aye. It is a vote. Is there anything else of this nature to be presented to the Association? If not, I will call for the report of the Committee on Exchange Rates. Mr. Ivers, of New Bedford, is the Chairman of that Committee. Has that Committee anything to report?

MR. IVERS—I did not know that I was Chairman of that Committee. At any rate, I have no report to offer.

THE PRESIDENT—Has the Committee done any work?

MR. IVERS—No, sir; it has not done any work to my knowledge.

THE PRESIDENT—Then we will pass that subject. The next, and the last of the regular committees, is the Committee on Extra Territorial and Toll Line Business. The Chairman informs me that he has made no report from that Committee, the Chairman being Mr. Storke, of New York. Mr. Baker, of Montreal, and Mr. Jackson, of Detroit, are the other members of the Committee, and I will be glad to hear from them, if they have anything to remark.

MR. JACKSON—I believe that I am on the Committee of Extra Territorial and Toll Line Business, but nothing has been done by the Committee, as Mr. Storke reports. The question of extra territorial lines has been largely entered upon in the discussion here this morning, and also has been embraced in Mr. Lockwood's report, and we are no doubt at that interesting stage of the business where this becomes the subject of future development. Therefore, as the Committee has no report to make, I think it is properly a question for discussion, and no doubt as many points can be brought forth in that manner as could be raised by a report from the Committee. There are some points which are manifest to my mind in this connection, the most important of which in the construction of lines is that we require a better conductor

for this purpose than we have at present, and that we must have something like copper, or something which will give us what we desire. My observation of copper wire has been that it is a matter which must be taken up very carefully. It is a proposition for experienced metallurgists to tackle in order to produce a copper wire that is more homogeneous than any we have at present, and a wire with better staying and lasting qualities. The wire drawers have succeeded in producing a wire that is sufficiently tenacious, but it is a question in my mind whether this wire is not subject to electrical changes, and whether it will not harden to such an extent as to change its condition, and, therefore, after a time, offer as much resistance as an iron wire. I am inclined to think that is the case, as the wire is now made. No doubt, however, that matter can be overcome in the treatment of the metal. Not long since, I was at Houghton, where the principal amount, and in fact all of the Lake copper, is mined and smelted, and, while there, was shown a sample of wire that was produced by the metallurgist, or the manager of the smelting works. His method was to extract from the copper all the oxygen, and thereby reduce the metal to its native state before being exposed to the atmosphere. It was his idea that this wire would stand for almost an indefinite period of time. Certainly, it surpasses anything I have ever seen in copper, and when broken—and it is quite difficult to break it—it leaves a crystalline surface, similar to any other metal which might be tempered or heated in that manner. I only mention the matter of this copper as something which was incidentally brought to my notice. It has not as yet been tested in practice, neither is its resistance known ; but I do not see why there should be any more resistance in it than any other copper. A short piece which I brought home with me, of No. 12 Birmingham gauge, shows a resistance to a breaking strain of 457 pounds. I was a little unfortunate with this piece, because, in putting it in a vise, it was fractured, and I am inclined to think it would stand a larger strain than that. The disturbances in this business are well understood by everybody familiar with them. We have in

our country about 3,400 miles of extra territorial lines, and we have to meet those natural difficulties which are inherent to the present state of the art, and it strikes me that we have only to hope that some development, which may be brought out in the future, will eradicate those difficulties. The business as it stands is not particularly progressive, that is to say, we are increasing the number of our offices, and the mileage of our wires, but I am unable to see that our business is growing in the old established routes, except in the extension to points where communication is to be had, which is about the only observable growth in the receipts. I think we are doing as much business over those wires as the capacity of the wires will handle, and we are accommodating the classes of people who are willing to struggle with these difficulties of service, as they exist at present. That is all I have to remark on the subject. I may add that in constructing this class of lines it will pay to build them carefully, just as it will with any other class of this plant, and good insulation of these lines is, to my mind, very essential.

THE PRESIDENT—Has any other gentleman anything to remark on this subject?

THE SECRETARY—I would like to ask Mr. Jackson whether he has noticed any effect produced by the reduced size of copper wire, that is, whether you get less effect from the reduction of the diameter of the wire, or the reduction of the resistance of the wire? Do you not get a two-fold benefit by the use of a copper wire, one of which is the reduction of the diameter of the wire, and the other is the reduction of the resistance?

MR. JACKSON—We have only one copper wire in existence, a No. 12, which is hung on poles along with five other wires a portion of the distance. We have induction in this wire the same as in others, but the induction is not so great, because the talking is so much louder. We are working that wire 192 miles. The extra quality of the conductor is also a help to us.

THE PRESIDENT—How do you find that copper wire,

so far as you have used it, to stand in comparison with an iron wire?

MR. JACKSON—We have only had it in operation for a few months, and, as yet, we have had no serious difficulty with it. We have only had one break in it, and that was a break which would have broken any wire, being caused by the falling of a heavy limb. The question of elongation and contraction is one yet to be determined by time.

THE PRESIDENT—Is Mr. Doolittle in the room? He does not answer, but I saw him here a moment ago. I intended to ask him to state the result of his observation on the standing of the copper wire between New York and Boston. However, perhaps Mr. Lockwood can enlighten us on that subject?

MR. LOCKWOOD—Before saying anything on that point, I would state that I was last week in association with William Henry Preece, the electrician of the British Postal Telegraphs, and I remarked to him that the tendency in this country was to substitute hard-drawn copper wire for iron. He said it was not the tendeney in his country, but the practice, and that they were not putting up any other lines either for telegraphs or for telephones. That, I think, should be a word of encouragement for us, for they do not adopt any innovation lightly in that country; and, more than that, he said they got a wire which, although hard, tenacious and strong, had a conductivity of ninety-five per cent. of pure copper, which I think is a very good showing. With respect to the wire which has been built between New York and Boston, it is, as you know, a double line, and I think is nearly three hundred miles long, by the way the wire goes. It took a long time to build it, and when it ran through exchange territories it was usually put on the lowest cross-arm of the poles. It was completed in the winter, and it ran through a section of country in which there was a great deal of blasting of stone and marble. It ran through a kind of mild granger territory, and it consequently had a very hard time for the first three months of its existence. When it was working—which was about one hour a week—it

worked first class. One day, it would be down with blasting. The next day, some farmer would come along in this mild granger territory, and take out some three or four hundred yards and use it for fencing. He had no objection to it because it was copper. The next day, some schooner would come along in the Harlem River, and drag up all the cable; and it had a miserable habit of always having these breaks in the middle of a conversation. However, it got over these habits after a time, and now it operates very well. There was another trouble in connection with the wire. It was found that the line-fiends put an iron tie on a hook, and that, moreover, they would put those ties on so tight as to break the wire at the point of the tie. Mr. Doolittle, with his usual ardor, devoted himself to overcoming each of these obstacles, and with his usual good fortune he has succeeded in remedying them, and I think the line may be expected to be a success. In all this line the Britannia joint was used. The two ends of the wire are laid together. The ends are turned up a little, and the whole is wrapped with fine copper wire and soldered. It makes such a joint that you can pull the wire apart before the joint will break, and I think it would be better if we adopted that joint in iron wire, and in every kind of construction. It was a necessity with this wire, because its texture is somewhat crystalline, and I doubt whether a twist joint can be relied upon to keep it in its place. However, I see that Mr. Thornberry is here, and I have no doubt he can say something of interest to the Association in reference to this matter. I have nothing further to add, myself, and I yield to him.

Mr. THORNBERRY.—All the reports from the wire at present indicate that it has not yielded any more than iron wire would under the circumstances, and I think that is true, because I have had statements from the whole length of the wire, and from men at different points, who, I think, are not prejudiced. The wire has not broken under circumstances where iron wire of the same size, or even of greater strength, would have done so. As far as its talking qualities are con-

cerned, most of the reports say that it talks better than anything of the kind in existence, as far as they know anything about the subject. In fact, they say that the correspondent at the other end of the line is right at the elbow of the speaker. The wire has a conductivity of five ohms, or a fraction less, per mile, is of No. 12 wire, or rather it is a little less, but it is drawn for No. 12, Birmingham gauge,.and is 300 miles long. The whole resistance is about 3,000 ohms, or a little less than that, but in ordinary conversation we say 3,000 ohms for the line. It does not seem to have lost any in conductivity for the time it has been up, which is now five months. For the last three months it has been in very nice working shape most of the time, but, as Mr. Lockwood remarked, when we first started we had a bad time with it. We might have New York to-day, and not get it again for a week. Then, it was built during the period of a great storm in the spring, which broke down all the small wires, which continued to break down afterward, and it bothered us a great deal in that way. Now, I think, it is all right, and that we can confidently expect good results from it.

MR. LOCKWOOD—What was the effect of working this wire when you worked it single, or worked two wires on a ground circuit?

MR. THORNBERRY—We could converse on a Blake transmitter, but we could hardly hear each other, on account of the induction and the noise. The wire is now working with two subscribers between New York and New Haven, at present. It is not in actual business yet. It is more an experiment than anything else. We are using metallic loops for each subscriber, but, in case of necessity, can talk through a metallic circuit to the further end. We talk through a single wire on induction coils specially constructed for the purpose. A gentleman said he had doubts of the conductivity of the copper wire remaining the same. Mr. Doolittle put up some five or six miles of those wires in Ansonia, Connecticut, of a quality of eight or ten per cent. below pure copper, and those wires have worked well and given every satisfaction; and now, after six years' use, the

oxydization is not more than one-twenty-fifth of the diameter, and the line is now in very nice shape and is a splendid looking apparatus at present.

THE PRESIDENT—I see that Mr. Doolittle is in the room, and I will ask him to give us the benefit of his experience on this subject. I may say to the gentleman that we are talking about copper wire, and that I would like him to tell the Association anything he knows regarding the manner of the standing of copper wire, so far as his experience goes. I also think he has made some experiments with reference to the breaking strain, the results of which might be of interest.

MR. DOOLITTLE—I should be happy to give the Association the benefit of any knowledge possessed by me upon the subject of hard-drawn copper wire; and will say that during the month of November, 1877, I conducted some experiments at the wire mill of the Ansonia Brass and Copper Company, with the object of making available for telephone purposes the best known conductor of electricity. First, on account of its superiority as a conductor; and, second, its lasting qualities. After repeated trials I was enabled to produce a wire which seemed possessed of the necessary requirements of tensile strength and conductivity. This (under my personal supervision) I had placed upon poles, which were set at the usual distance apart. After the lapse of three years I caused a section to be taken down and submitted to a test for deterioration, etc., in comparison with a section which I had retained in my possession and not used. The test was made by Mr. T. A. Watson, of the American Bell Telephone Company, who reported to me that he found no difference in the two samples. I have thus far given my personal attention to this matter, and within a few days have caused to be taken down another section of the same line and had it submitted to the usual tests. It will be seen that the wire has now been in use nearly seven years, and is apparently as good in every respect as when first put in use. This is a subject in which I have been deeply interested. Our copper wires from New York to Boston (which Mr.

Vail had the pluck to order constructed) are a perfect success. All who have used them for communication pronounce the result to be superior to the average local connection.

MR DURANT—How does the Blake transmitter work on that?

MR. DOOLITTLE—It works very fairly. We can use the Blake transmitter or the Edison with success on metallic circuit between New York and Boston, a distance, by way of the line, of about three hundred miles.

MR. DURANT—How far apart are these wires?

MR. DOOLITTLE—They are from eighteen to twenty-four inches apart. Both wires are on the same cross-arm and upon the pins next to the pole on either side, and are run parallel in that way the entire distance.

THE PRESIDENT—What is the result of your experiments as to breaking strain with specimens of the same wire?

MR. DOOLITTLE—We made a single test of the wire while it was being drawn by the Bridgeport Brass Company, and we found the breaking strain to be 414 lbs. in a section of 165 feet. I believe that the average breaking strain would be under that, somewhat.

THE SECRETARY—What was the weight per mile?

MR. DOOLITTLE—The weight per mile is 185 lbs. The diameter is $\frac{107}{1000}$ or nearly the size of No. 12 Birmingham gauge. We took this diameter in order to secure the uniform weight of 185 lbs. per mile.

THE SECRETARY—Was this wire which is about seven years old in electrical use continually?

MR. DOOLITTLE—Yes, sir; continually. In the early days we used a battery current, but afterwards substituted the magneto. This wire was used upon an exchange system connecting the different mills and factories of the Ansonia Brass and Copper Company, and an operator was employed to make the necessary connections.

THE SECRETARY—But it did not have a battery connection at the time you made your last experiment?

MR. DOOLITTLE—No, sir; it was in ordinary telephone use with magneto bells.

MR. PHILLIPS—Was it hard-drawn copper wire?

MR. DOOLITTLE—It was hard-drawn copper wire.

MR. FAY—I would like to have somebody tell me how to make these lines pay. We can construct them, and any number of them, without any trouble; that is, we have always been able to build a line which was expensive enough to allow us to transmit conversation under ordinary circumstances. That is one thing; but how are we going to make them pay after they are constructed? Our gross receipts have been on the average about $20 a mile on extra territorial lines. The Western Union Telegraph Company claim about 140,000 miles of wire, and about five or six million dollars per annum, that is, say, about $40 or $50 per mile received from their wires. Now, how are we going to compete with them in rates, on lines working, say, seven or eight hours against their twenty-four, and earning $20 a mile against their $40? I think we can do it, but my observation has been that our investment in long lines has been to render those investments permanent, with little or no return from them. I do not know whether that has been the experience of other people or not.

THE PRESIDENT—Mr. Fay has suggested a problem which our Company is at work upon to-day. We have not by any means solved it, but I will tell the Association the manner in which we are working at it. We began by recognizing the fact that a long telephone line is available for earning purposes only about six hours out of the twenty-four, and, as a consequence, we did not, and have not, attempted to furnish that line on prices which are in any sense competitive with telegraph prices, for the simple reason that we knew, and claim that we are going to furnish something which cannot be put in competition with the telegraph, or rather that the telegraph cannot be put in competition with us, because of the superior character of the service which we expect to furnish. We give something immediate and complete, while the telegraph gives something completed only after a very considerable lapse of time. We are working, or trying to work, this copper line between New York and Bos-

ton in a business shape, and we have started it in this way. We run it on to a metallic switch-board in New York and New Haven, and we are now at work doing all we can in the way of getting subscribers between New York and New Haven, who will be connected by metallic loops from their offices in New Haven to the switch-board in New York, and from their offices in New York to the switch-board in New Haven, and who will be entitled to a limited use of that wire substantially as if it were a private telephone line between their office at one station and their office at another. We have taken a three months' term as the limit of time, and we have given them two communications between the hours of nine and five of each day, and we charge them at the rate of $620 a year for the service. We do not know whether that will pay or not; but we look at it in this way: It is substantially the equivalent of a private telegraph line between their two offices. Now, New England territory is peculiar in this regard. There is out of it in New York, and there is in it in Boston, two foci toward which all business concentrates, either in one direction or the other. The water-shed runs somewhere east of the Connecticut river, through Massachusetts, or north of Springfield, and east of New London, through Connecticut, and the business one way goes to Boston, and in the other way goes to New York. Looking closely over the field, we calculate that there are in Connecticut over one hundred firms doing a business which will warrant their communication in this way with offices in New York city, a service for which we can receive from $600 to $1,000 a year, and possibly over that, and, if that business can be developed, that with that sort of income it can be made to pay some sort of profit upon the amount of investment necessary to furnish the plant. Of course, with a limited number of subscribers and users, we need only a limited plant. We do not have to provide what we think would be an unlimited public use, for such a region. We do not have to provide more facilities than we are doing on the average. That will reduce our permanent capital to be expended, and we think that the business of private telegraph-

ing which is done between New York and Boston will afford room for private telephony, which will be done for half what it costs for private telegraphy, and, as we think, done successfully and with better results. I believe that $3,000 per year is the ordinary price paid for half of a two party line between New York and Boston for telegraph purposes; that is, one telegraph line between New York and Boston produces $6,000 a year. Now, we think we can make a satisfactory metallic circuit between New York and Boston produce more than that, when both the circuit and the business are in shape. We expect to get from the American Bell system in connection with the Hunning's Transmitter, results which will be so satisfactory to the owners of establishments which require service that they will gladly accept it at remunerative rates. At present, we are just starting. We have two subscribers in New York, who have been using it for a fortnight, and who use it after two o'clock, and we charge them extra.

MR. SABIN—Will you give the price?

THE PRESIDENT—Twenty-five cents. Then we have another subscriber in New Haven, where we were running with our metallic circuit, and we have about a dozen on the immediate line between New York and New Haven that we expect to be able to hitch up in that way. When that is done, I think it will induce others to join, and will perhaps lead to some form of development of business for the public, so that they must use it. We have thrown our office in New Haven open to the public, and we have said to the people, "If you will come into our office, we will throw it open to you, and you can talk to any subscriber in New York for fifty cents." Of course, we cannot do it with a profit, and we cannot do it in practice, but we know that all New York is not coming in at once, and so far we have managed to get along. It so happened that on the very morning when the announcement was made in the New Haven paper that our office would be thrown open to the public, a man came into the office and wanted to have telephone counection with some small place in New York. By

a most unusual run of good luck for a new telephone enterprise, the wire was in good working order to Mr. Thornberry's office, and Mr. Thornberry had a switch to the point where the party wanted the message transmitted, and he had a good transmitter at that end, and so the service was very well done. It was a very happy incident. The gentleman who wanted to use the telephone was a traveling man, and the use of the wire saved him a trip to New York for that day, and he paid his fifty cents with great satisfaction and went away delighted. I believe that so far as any use of that facility has been desired by the public, we have had extremely good luck in getting what we wanted in New York City, but we are not connected with all the exchange places in New York, and we do not know at what moment we may be called upon to perform impossible tasks. However, as we cannot very well make everybody understand just what service we can give and what we cannot give, we have thrown our office open to everybody, and asked the people to come in, and see what we can do in the way of rendering them effective service. That is the way the telephone business between large places looks to-day. I do not know that I can say anything more about it, at present, but, Providence willing, I think I can tell you more about the results twelve months hence than we can to-day. I do not know, and I cannot tell you, how much it is going to cost us to maintain this line, or how much it is going to cost us to operate it and other similar lines. We have to have at New York and at New Haven not an ordinary operator, but we have to have a Morse operator. We have two lines running from New York to New Haven, and we have to make up lines as circumstances permit. With four lines we have an advantage of two circuits, and we use the Morse or other systems as exigencies arise. As yet, it is only an experimental service, and we cannot determine how large it may become in the future.

MR. HALL—I have a few figures which have been handed to me bearing on the question of the receipts from trunk lines. The Buffalo Company has 567 miles of trunk lines in

operation, and the rate of receipts this year has been $31.68 per mile of wire. That is considerably above the figure which Mr. Fay gives us for his lines. These lines have shown a steady increase all the time they have been in operation, and I have every reason to believe that, before long, they will be up to the Western Union rate of $40 per mile. This 567 miles of wire is distributed among 64 stations, averaging about 9 miles to each station, and giving an income from each station of $280 a year. There is another point in this matter, which is that the extra territorial business which we have undertaken to do has been very badly done. You all know that the wires have not worked with any satisfaction, as a commercial matter. Now, substituting for 25 miles of iron wire 25 miles of copper wire between two stations in our territory has resulted, in the first month after the change, in an increase of business amounting to twenty per cent., and the months are presumably the same for business, so that we think this is a fair comparative statement, and we think the difference of twenty per cent. in growth is entirely due to the change from the iron wire to the copper wire giving an infinitely better service ; this not with a metallic circuit but with a direct copper wire. The result of that has been to encourage us to extend our copper line facilities, and we are now building, and will have completed in a few days, a line from Rochester to Buffalo, N. Y., which will be 95 miles long. We are running now a single copper wire, but we intend, if the results from that are much better than with the iron wire, and if the business will show much increase, to run a second copper wire and make a metallic circuit.

MR. SABIN—What is the tariff from Buffalo to Rochester?

MR. HALL—It is 30 cents.

MR. SABIN—That is too cheap for that distance.

THE PRESIDENT—Of course it is too cheap ; but you cannot get more.

MR. HALL—Those are the two extreme points in our territory, but the rest of the wires we have in use are producing

an income of $31.68 per mile per annum. The average rate in the territory is about 24 cents. This 30 cent rate between Rochester and Buffalo is between extreme points.

There is another point bearing on this question, and that is, that we have no measure of the extent of this extra territorial business, but I believe that good service will be fully met by encouragement from the public, within reasonable distances, and that it will be a profitable business. A little item in my own personal experience may not be out of place in relation to that. We have at our manufactory, about 25 miles from New York, a wire connected with the New York and New Jersey Extra Territorial System, an ordinary trunk line and exchange connection. Owing to the cable crossing the North River, we found that while we could hear from the New York office to the factory, it was almost impossible to make the New York office hear what we said at the factory. The tones came loud enough from the Blake Transmitter, but they were not clear enough, and it was impossible to get a distinct conversation. The result was that we used that wire very little. It was almost worthless, and in conversation with Mr. Sargent, the General Manager of the New York and New Jersey Company, I told him of the difficulties under which we labored; that we had a constant use for that line, but could not use it, and that, consequently, his Company was not getting the revenue which we were prepared to give it for our service, if that service could be given to us. Mr. Sargent took some pains to equip our office with an Edison Transmitter, and he arranged a switch so that from the factory office I could talk over either transmitter, the idea being to test them comparatively, and see what results we could get. The effect of putting in an Edison Transmitter was that while the tone in New York was not as loud, yet we could all talk, and conversation was perfectly clear and distinct. Their giving us a transmitter that would work has resulted in a very large increase of business, and helped that wire. Before that, we had been frequently troubled with the complaint that people could not hear, and before this new transmitter was put in, we used it scarcely at all, while

now we use it several times a day, and if the line worked as well as the New York and Boston line does with the Hunning's Transmitter, so that we could talk correctly and readily about all our matters, I venture to say that we would send from five to eight messages a day over that wire. Taking the number of people who are engaged in business in New Jersey, and who are connected with their correspondents in New York, that ratio of business would make a very profitable extra territorial business for the New York and New Jersey Company. Therefore, it seems to me that the whole thing resolves itself down to a point of getting the service into such a condition that people can use the instruments. Give the people instruments which will work, and the business men will support you.

MR. FAY—That may all be true, but still it does not answer my question. What I want to know is, how we are going to make these instruments pay after we get them? As I understand the remarks of Mr. Hall, the business of which he has spoken has been in the nature of private line business between two different branches of offices of the same concern. What I want to know is, how we are going to reach the public at large.

MR. HALL—The figures which I gave for the Buffalo Company were entirely for the business of the Company, covering seven counties, and were not at all with relation to private line business.

MR. FAY—I was going on to say, that in speaking of the service, we have had a great deal of difficulty with the service, and we have given a great deal of attention to the bad serivce which has been rendered. We have found that inside of a radius of forty miles from the city of Chicago we lose about five per cent. of the connections called for. In running from forty to sixty miles we lose about seven per cent., and beyond sixty miles we lose, on an average, about fifty per cent. That is not entirely owing to electrical difficulties, but because the population is so sparse that we cannot afford a suitable number of wires to give sufficient accommodation. Two men come into an office, and both

want to talk at once, and, of course, one must have the precedence and be given the use of the wire, and while the one man is using the instrument, the other gets tired of waiting, and gets impatient and goes away. The trouble in this thing is that there does not seem to be business enough to support local offices scattered along the lines, as a rule. We have to meet the same problem which the Western Union Telegraph Company had to face in connection with the railroad companies. They could not enter into telegraph competition with the railroad companies, at small stations, because they did not receive business enough from those stations to pay them to keep an operator there, while the business of the railroad companies compelled them to have an agent at each station, and therefore the railroad and the telegraph interests were necessarily united. That is the way in which the union of those interests gave the Western Union a means of relief in that direction, but, as yet, we have not reached such a point, and we have not those facilities, and the result is that our receipts have not been satisfactory. Between the cities of Milwaukee and Chicago, where we expected large receipts, we are losing between seven and eight per cent. of the business, and the result is, we get out of that line a gross earning of $250 a month for a line which is about 105 miles long.

MR. HALL—Does that line work satisfactorily?

MR. FAY—When it works, it does; but we lose between seven and eight per cent. of the business.

MR. HALL—I did not refer to the financial part of the question. When I asked if it worked satisfactorily, I meant electrically speaking.

MR. FAY—I am speaking electrically, and for the reasons which I have given we lose seven or eight per cent. of the business of that wire. Our rate to Milwaukee is 40 cents, and the telegraph rate is 15 cents, and I think that keeping our rate at 40 cents is the only way in which we get anything at all. We could not come in competition with the telegraph people, and if we were to reduce our rate to 15 cents, I do not think we would get any more business than we do now.

We tried to see what effect a reduction in rates would have, in Michigan City, where we reduced our rates from 40 cents to 25, we found that that did not give us any more business.

MR. EASTABROOK—I think that a very large part of the difficulty in this respect comes from bad service. It is bad service that makes the public dissatisfied, and the dissatisfaction is not confined to the man who receives the bad service, because he goes out and talks to his friends and neighbors. A man comes to an office and gets bad service, and he goes out and tells the first man he meets that the thing won't work. I represent a district where the results are over a wide extent of territory. We have 260 day offices, and we put them in little towns and hamlets where there is only a handful of population, and we go to some merchant, or business man in the place, and put a station in his store, making him give us a guarantee that the receipts shall be so much a month, or else we will not put a station at that place. Our lowest income is $4 a month, and we change that according to circumstances, but never yet have we lost an office when we have asked for an increase of income and a change of guarantee.

MR. SABIN—What commission do you pay your agents?

MR. EASTABROOK—Twenty per cent.

MR. FAY—Our experience with our agents has been the other way. They come to us and say, "This thing is more of a nuisance to us than it is worth; take it out."

MR. EASTABROOK—Our receipts are in the neighborhood of $40,000 a year, and they are constantly growing from month to month.

MR. FAY—I would like to ask Mr. Jackson what his receipts are per mile?

MR. JACKSON—Our receipts are about $28.

MR. EASTABROOK—Our receipts are somewhere between those of Mr. Jackson and those of Mr. Hall, but we are constantly growing. We are not building any new lines unless we can sell coupon tickets for two years. We are earning and recovering the 20 cents we lost in the first place, and doing a larger business than we ever did.

MR. GIFFORD—Does that $32 a mile mean gross receipts?

MR. HALL—Yes, sir; it is our gross receipts.

MR. BAILEY—I would like to ask the gentlemen who have had experience in splicing with hard copper, if they use sleeves. The Baltimore and Ohio Company use sleeves for the purpose of allowing the solder to enter into the wire. Mr. Pages says that they gave him very excellent satisfaction, but I must say that that has not been the case with us, and if any of the gentlemen here has had any experience, I would like to inquire what that experience has been in stretching hard copper wire on poles. I found that if the wire was drawn tight enough it would break where the indentation was made by the wires, and if it was tied loose enough to prevent it from breaking, the span would slip back as soon as it was released. Our men then went to work, making three or four convolutions of the tie-wire, and doubled it back on itself. That I find works very nicely, and prevents the wire from slipping on the tie. I would like to know what experience other gentlemen may have had with the splice.

MR. DOOLITTLE—I have not had any experience with the splicings, but in putting on a tie-wire we used a soft copper wire, and I always instruct the line men to put it on with their fingers and not with the pliers, and to use soft wire in place of the regular hard drawn copper. I think Mr. Mayer, of the Electrical Supply Company, may be able to give Mr. Bailey some idea as to the mode of fastenings.

THE PRESIDENT—Is Mr. Mayer in the room? If Mr. Mayer is not here, can any one answer Mr. Bailey's question regarding experience with a sleeve joint in copper wire? The Chair hears no response. It is now one o'clock, and after, and there are no more reports to be expected from the committees. Mr. Berthon is, however, desirous of explaining to the Association some of the workings of the apparatus in Paris, which Mr. Lockwood will introduce, accompanied with plans and drawings, which will give us some occupation for the afternoon, previous to the final adjournment. A motion to take a recess until half-past two o'clock will be in order. Does the Chair hear such a motion?

MR. SABIN—I move that the Association adjourn until this afternoon at 2.30 P. M.

The motion was agreed to, and the Association accordingly took a recess until the afternoon.

AFTERNOON SESSION.

THE PRESIDENT—It is after half-past two o'clock, and the Association will come to order. As was announced by the Chair this morning, Mr. Berthon has kindly consented to favor us with some explanations of the workings of the telephonic system as it is operated in France, previous to which, however, Mr. Lockwood desires to say something introductory of the subject. Mr. Lockwood has the floor.

MR. LOCKWOOD—Without any preliminary statement, permit me to say that Mr. Berthon has brought to my notice, in order that I may bring it before the Association, what he calls a transmission in duplex. It is simply an arrangement in circuits by which you can duplex a telephone. He brought it to me, and asked me if I was going to duplex a telephone, what method I would try. I told him I would try the Wheatstone Bridge method. He said it was exactly what he had. I have here a diagram illustrating its operation, and you can all see the general idea of it. There are two lines running from one terminal station to another and grounded at two points, as the drawing shows, and while they are single as far as *this* is concerned, they are double the rest of the way until they reach the other end. There are two wires between the stations, which we may call No. 1 and No. 2, and those can be worked as a metallic circuit. *This* circuit represents one telephone set, while the letter A' in the drawing of the other end represents a corresponding telephone set. These two together work in a metallic circuit with one another. The words spoken in *this* transmitter are not re-

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NOTE.—The words on this page which are underscored refer to parts of the drawings.—R. A. W.

produced in the receiving telephone, which is in the ground terminal at the opposite station. Neither are the words spoken on the transmitter at A reproduced at the receivers B'. B and B' are also telephone outfits which respectively represent a telephone transmitter and receiver. The other smaller diagrams which I have here are much on the same line, except that in *this* case the terminal is extended to an indefinite length, and made to run to a branch station, while in the second one the extreme stations are connected by a metallic circuit, the elongated stations themselves being the approaches.

This system, Mr. Berthon says, may be multiplex to almost any extent. Thus each pair of metallic circuits may again constitute one side of a bridge with another pair, and that may be added to almost indefinitely in that way, the terminals of all being connected with the ground. I do not know how far he has carried this out, or how much of a practical result he has effected by it, but he will now take the floor and answer any questions which you may wish to ask him.

THE SECRETARY—What is the object of that arrangement of circuits?

MR. BERTHON—The object is to use every wire in a large system operated by a metallic circuit; in other words, to have as many metallic circuits less one as you have single wires, the last circuit being consequently a ground circuit.

MR. LOCKWOOD—Do you use it to any extent?

MR. BERTHON—We use it to duplicate our trunk lines.

MR. LOCKWOOD—What has been the result of your experience with it?

MR. BERTHON—It works quite satisfactorily.

MR. LOCKWOOD—When you have a number of pairs hitched up together, does one interfere with the other?

MR. BERTHON—No, sir; not a bit.

MR. DURANT—If I understand it, the two pairs will constitute a third pair?

MR. LOCKWOOD—Yes, sir; that is the way I understand it.

NOTE.—The words underscored refer to drawings exhibited.

MR. DURANT—In other words, you have two multiplex circuits for a trunk line, and those connected together make a third, and the third connected together makes a fourth, and so on indefinitely.

MR. LOCKWOOD—So I understand. I would like to ask Mr. Berthon if two circuits are coupled together whether two messages can be sent without one interfering with the other?

MR. BERTHON—Yes, sir. But you cannot send more messages than you have wires. In other words, you have the benefit only of the metallic circuit.

MR. LOCKWOOD—By that means you think you can transmit and receive telephonically a longer distance with greater facility and greater silence than if you use them with single wires only?

MR. BERTHON—Of course, because we have the benefit of the metallic circuit. The lines have to be of equal resistance; that is the only condition.

MR. LOCKWOOD—What is the length of your longest line?

MR. BERTHON—I think the length of our longest line is about eight miles through trunk lines in Paris.

MR. LOCKWOOD—If you only put two line cables together you lose one of them?

MR. BERTHON—Of course.

MR. LOCKWOOD—Then the advantage does not appear until you have several pairs of these connected together, or, at least, two pairs?

MR. BERTHON—Yes, sir; that is the way it works.

MR. WILSON—In practice, do you have much difficulty in balancing?

MR. BERTHON—No, sir. Of course, with underground lines they must balance. With overhead wires it might be more difficult, but we have been talking on well insulated overhead wires, and have succeeded very well. With bad insulated lines, of course, one cannot expect any good result.

THE PRESIDENT—Let me ask you, Mr. Berthon, if you have any more plans which you desire to bring to the attention of the Convention? If you have, I am sure the Association will be very happy to listen to anything you have to say.

MR. BERTHON—I have a number of plans here which any gentleman is welcome to examine. As to subscribers on one line on the same circuit, I understand you do not do much in this country?

MR. LOCKWOOD—We do not do as much as we would like to.

MR. BERTHON—We do it, but do not find it very profitable, because the process by which we can obtain good results is rather complicated.

MR. LOCKWOOD—Perhaps you can explain, in a few words, what you mean?

MR. BERTHON—I will explain as well as I can. One arrangement is for four subscribers on metallic circuit. We have four keys at the Central Office, and when we wish to call one subscriber we call him by a positive or negative current sent on one or other of the wires, the wires being grounded at subscriber's office. That current goes through the ground, positive or negative, on the one wire, and reaches the ground at the other end, so that with polarized relays at subscribers we can call the two subscribers branched on the first wire and the two branched on the second wire, which makes four. This is one of the best combinations we have for calling four persons on one circuit.

MR. LOCKWOOD—Then that amounts practically to an individual signal by using different polarities of battery?

MR. BERTHON—Yes, sir. Using different polarities of battery to keep the lines so that one subscriber shall not interfere when the other is talking, and we do it in some instances by throwing the battery on our lines at the very moment when one subscriber is talking. There is a dial that shows whether the line is occupied or not. We throw, automatically, a current on the lines; that same current cuts out the ground so that the talking is carried on metallic circuit. This same current throws a dial which shows line busy.

MR. LOCKWOOD—That is practically equivalent to the testing signal we have in use in our multiple board, only instead of having a dial we have a cell or battery in the operating room, so that if we hear the click we know that the line is in use.

MR. BERTHON—We do the same with the galvanometer, which can be used for the same purpose. If the operator does not get the signal, he waits until he gets the signal on the needle of the galvanometer. We have been using some clock works brought from the United States, which we modified in some kind of a way, so that we could use them practically. We have about 120 lines working that way with clock work.

MR. FAY—How many stations on a line?

MR. BERTHON—Six stations. The only difficulty we met with was to know whether the line was occupied, and that was accomplished by putting a galvanometer to each subscriber, so that when he presses the button, if the galvanometer moves, he knows that the communication is with the Central Office, or if it does not move he knows that the line is occupied by some one, and if he should take his telephone from the hook he cuts the connection.

MR. LOCKWOOD - Are the clocks which you use costly?

MR. BERTHON—No. They are ordinary American clocks, bought in this country and modified for our purposes.

MR. LOCKWOOD—How do they affect the individualization? Do they cut off the telephones at another station?

MR. BERTHON—Yes, sir; we have to secure secrecy. When another subscriber hooks on the line, of course he cannot hear anything. Nobody can hear anything. Of course, they do not want to hear any conversation which is not their own.

THE PRESIDENT—When one of our subscribers comes in and can't hear he swears.

MR. FAY—I believe a Frenchman is too polite to swear over a telephone.

MR. BERTHON—Not always.

MR. FAY—Do you have any subscriber who swears?

MR. BERTHON—Sometimes.

THE PRESIDENT—Do you disconnect the subscriber if he swears?

MR. BERTHON—No, but the girls report it ordinarily, of course. I do not know that I have much more to say. I

have these drawings here if any gentleman desires to look at them.

MR. SABIN—Have you a cross-section of one of your larger sewers with you?

MR. BERTHON—No, sir; I have not. I have a small one, but it is in a book, and I can only show it in the pamphlet. It is a section of a small sewer, but it shows the water pipe with small hooks for telephone wires. There are three of them, and there are 17 cables in each, which makes 51, and which gives us 357 wires in each sewer.

MR. SABIN—And your surveyors use one set for telephone purposes and another for electrical purposes?

MR. BERTHON—Yes, sir; but they never mix. I find that I do have a copy of a larger one. Here is a copy which shows three or four water pipes and shows the entrance of the cage in the basement of the palace. I will not take up the time of the Association any longer. I am very much obliged to all the gentlemen for the courtesy which they have shown me and for the attention with which they have listened to me. If any gentleman desires to look at the pamphlet which I have here, or at any of the drawings, I will be happy to have him do so.

MR. LOCKWOOD—Before we close this session of the Association, or before we proceed to any new or unfinished business, I think I simply express the sentiment of the Association, when I propose on its behalf a hearty and cordial vote of thanks to Mr. Berthon, for his presence among us, and for the counsel and instruction he has given us in reference to the various systems in Paris and in France. It is not often that we have with us from abroad a gentleman of his distinguished attainments, and I am sure that we have appreciated it most cordially.

MR. FAY—I have the greatest pleasure in seconding that motion, particularly because I was the recipient of great courtesy and hospitality at the hands of Mr. Berthon, last year, in Paris.

THE PRESIDENT—The motion is the proposition that a sincere and hearty vote of thanks be offered to Monsieur

Berthon for his explanations that he has given us of the Parisian system, and for the general information which he has given us on the systems there. Will you remark upon the question? As many as are in favor of the motion will say aye. It is unanimously agreed to, and I have the honor of presenting the thanks of the Association to Mr. Berthon.

MR. BERTHON—I am deeply thankful to the Association.

THE PRESIDENT—The formal business of this meeting is finished, but before we adjourn, I will call for the report of the Committee appointed yesterday upon the matter of the committees of the Association, and the method of bringing work before the Association at our future meetings.

MR. FAY—Mr. Storke, who was appointed Chairman of this Committee, was called away upon business yesterday afternoon, and asked me to serve in his stead. The Committee has considered the matter and submit two resolutions and an additional article to the By-laws, for the action of the Association. The resolutions are as follows:

"*Resolved*, That the Association would impress upon every officer and member the value and importance of complete and carefully prepared statistical information, and would earnestly request of each and every one in future to give his hearty co-operation in order to secure the same.

"*Resolved*, That the Association urges the contribution of individuals in the form of papers on subjects to which they may have given special attention, to be read by the authors before the Association.

Resolved, That the present Standing Committees of the Association (not including under this appellation the Advisory and Executive Committees) be abolished."

The amendment to Article 10 of the By-laws is:

"At each annual meeting there shall be appointed by the President a General Committee on Statistical Information for the ensuing year, of which the Secretary shall be *ex-officio* chairman. The number of members of this Committee shall be determined from year to year by the President, according to the amount of assistance required by the Secretary, and it shall be their duty to render the Secretary such aid in the preparation and classification of information for presentation to the Association as he may require."

THE PRESIDENT—Gentlemen of the Association, you have heard the report of the Committee, what action will

you take upon it? A motion to adopt or reject the report of the Committee will be in order.

MR. SABIN—I move the adoption of the report.

THE PRESIDENT—It is moved that the report of the Committee be adopted, and that the resolutions therein suggested be approved. The By-law will have to be amended by a special vote. The motion is seconded. The motion is that the report of the Committee be accepted and that the resolution suggested by the Committee be approved. The resolutions press upon each member of the Association the preparation of special and carefully prepared statistics, and also urge upon individuals the preparation of papers in which the individuals are particularly interested. As many as are in favor of adopting the report of the Committee, and adopting the resolutions suggested by them, will signify their assent by saying aye. It is a vote. The report of the Committee is adopted, and along with it the resolutions suggested by them. The question now arises upon the amendment to the By-law, which is to add the following to Article 10 of the By-laws:

"That the present Standing Committees of the Association, not including under this appellation the Advisory and Executive Committees, be abolished. At each annual meeting there shall be appointed by the President a General Committee on Statistical Information for the ensuing year, of which the Secretary shall be *ex-officio* Chairman. The number of members of this Committee shall be determined from year to year by the President according to the amount of assistance required by the Secretary, and it shall be their duty to render the Secretary such aid in the preparation and classification of information for presentation to the Association as it may require."

Will you remark on this amendment? The motion is to amend the By-laws, as read. Will you offer your minds on the subject?

MR. EASTABROOK—I would like to offer my mind to this extent; that a penalty of suspension or expulsion from the Association be attached for the non-fulfilment of Committee duties.

MR. LOCKWOOD—Then it is in order for every gentleman composing the Association to resolve that he will aid in carrying this amendment into effect.

Mr. FAY—I would explain that the object of changing the form of committees is to bring the control of the whole body of information more directly into the hands of the Secretary, and making him the responsible individual for the procuring and amassing of them. As it has been, the President has appointed the committees, and oftentimes the members of committees have been at a distance from each other, could not be consulted, or in many instances it has been impossible to consult them, or they have been unwilling to act. The idea of this resolution is that the President shall consult with the Secretary and delegate individuals who shall, with the Secretary, form a general committee, and those individuals, having been consulted and having accepted the responsibility, undoubtedly will bring forth satisfactory fruit in their endeavors.

THE PRESIDENT—Will you offer your minds further on this amendment to the By-laws? Are you ready for the question? As many as will amend the By-laws of the Association in the manner read will signify it by saying aye. The ayes have it. It is a vote. This Committee, as I understand it, will be appointed by the President, and the members will be notified after the adjournment of the Association. The Committee upon Wire Gauges, authorized by a vote of the Association this morning, will also be appointed by the Chair after the adjournment, and the members of the Committee will be notified by the Secretary, and possibly some suggestions may be made as to the mode of their action. It is a committee of importance which the Chair does not care to appoint without consultation with those particularly interested in this matter of wire gauges.

MR. KNIGHT—May I say just a word on that subject?

THE PRESIDENT—We shall be much pleased to hear you.

MR. KNIGHT—Of course, every one knows what confusion there is in this country caused by the number of wire gauges made by the different mills, nearly every mill having its own gauges, and scarcely any of the gauges being alike. Then there are mills that have iron wire of a size approaching the Birmingham gauge, and that naturally leads to the

thought of copper wire, which is a subject which has been brought very prominently before this Association, and which emphasizes the importance of having something near a uniform gauge for that kind of wire. Now, copper wire is generally drawn by the Brown and Sharp or Birmingham gauge in this country, unless otherwise specially specified. But the Birmingham gauge is generally given when we have orders for copper wire, and I think that matter should be taken into consideration by that Committee, as to which gauge copper wire should be designated when copper wire is required.

THE PRESIDENT—Is there not in England a standard gauge which has a legal sanction?

MR. KNIGHT—In March last such a gauge was adopted by the Standard Department of the British Board of Trade, and now no contracts or dealings in wire in England can be enforced legally, unless that gauge is used. That gauge approaches very closely to the old Birmingham, and which fixes a value on every number of the Birmingham gauge.

THE PRESIDENT—But still is a gauge varying from the Birmingham gauge?

MR. KNIGHT—Well, the old Birmingham gauge varied somewhat from that.

MR. LOCKWOOD—This is a more regular increase.

MR. KNIGHT—Take No. 12 wire, for instance. The old Birmingham gauge is 109–1,000 of an inch in diameter. The gauge now is 104–1,000. The difference is not very great; but it is there. It has been changed that much. It certainly would reflect lasting credit on this Association if it could inaugurate a movement which would result in something like a standard uniform wire gauge for this country.

THE PRESIDENT—The Chair will endeavor to appoint the Committee with a view to the importance of the subject which they have to consider.

MR. WILSON—I wanted to suggest that it will be probably well to authorize the Committee to go a little further than the mere fact of making suggestions to the Telephone Association, since there have been committees appointed

by the different scientific Associations in this country, to recommend Congress to take action which would make it legal, and I think that this Committee might co-operate with the other committees, and ascertain if they are distinct, or if they will allow us to co-operate with them.

THE PRESIDENT—Such a motion would be eminently in order. So far as it is recommended by the resolution, the Committee could not do more than adopt the standard, and recommend it to the Association. You may modify that action, or extend it, by adopting a resolution that their standard shall be recommended to the Association, and if adopted by it, shall be the standard of the Association.

MR. WILSON—I have no doubt that the Committee will act wisely and well.

THE PRESIDENT—It is supposed that this Committee will act with full information of what has been done by other parties. For instance, it is supposed that this Committee will act in concert with the Western Union Telegraph Company, and other wire users, so that there shall be a general standard suggested ; not that we shall create a standard for ourselves, but join with other wire users in creating a standard that shall be a standard for all of us.

MR. WILSON—That is what I wanted to suggest.

MR. EASTABROOK—I had just begun to draw a resolution on that subject, when Mr. Wilson made his suggestion. This is what I propose to offer:

"*Resolved*, That the Committee on Wire be instructed to report their action to the Executive Committee, and the Executive Committee be instructed to, in the name of this Association, co-operate with other wire users to establish a standard gauge."

THE PRESIDENT—While the resolution is eminently in order, I think the Association has reached a point which enables the Chair to say that the Committee will not act without co-operation with other users of wire, and I think they will act in concert with all the others. Before the Association adjourns I want to extend to you on behalf of Dr. Plush, the General Manager of the local Company, an invitation from the Bell Telephone Company, of Philadel-

phia, to visit their exchange in this city during your presence here. The Secretary will acknowledge to Dr. Plush, the reception of his invitation. Is there any other business to be brought before the Association?

MR. KNIGHT—There is just another thought in connection with that Committee. It seems to me entirely proper that they should take up the question of specifications after which wire should be made. There is no set of specifications according to which Telephone Companies desire their wires to be made. The Western Union have such specifications, and it is an easy matter to draw a wire to such specifications; but there is nothing uniform about it. Some Companies do not know what they want, either in tensile strength, or anything. It seems to me the Committee should take that matter up, and suggest something in that line. That matter was suggested to me some time ago by Mr. Carson, and they have settled upon a certain standard for the Southern Bell Company.

THE PRESIDENT—Is it barely possible that the specifications of one Company would not suit the convenience and desires of another Company. We are in such a condition of the Telephone business, extending through such a range of latitude and longtitude, and embracing so many different kinds of climate, that perhaps what would be suitable for one territory, would not be acceptable to another.

MR. KNIGHT—It would seem so, when one Company wants a breaking strain of 500 pounds on steel wire, and another thinks 300 is enough.

THE SECRETARY—I have an application for honorary membership from the "The Clark Insulated Electric Wire Co., Limited, 419 Walnut St., Philadelphia, Sept. 17, 1884." I move that they be admitted to honorary membership. The motion was agreed to.

THE SECRETARY—I am requested by the Palmer Wire Company to state that if any gentleman in attendance has failed to receive a copy of the table furnished by that Company, Mr. Knight will be glad to supply them, on request.

THE PRESIDENT—You have heard the statement of the

Secretary. Is there anything further to be presented? If not, and if the business of the Association is completed, a motion to finally adjourn will be in order.

MR. SABIN—I move that we adjourn.

MR. DURANT—Before that motion is adopted, allow me a moment. At the last meeting of the Association, at Cincinnati, Mr. Lockwood entertained us with a very interesting statement of the condition of the patents. I presume all that can be known in relation to that matter is generally known to the Association now, but I would like to ask to what extent the infringing companies have exchanges in operation outside of Philadelphia?

MR. LOCKWOOD—Is that question addressed to me?

MR. DURANT—Yes, sir; if you can answer it.

MR. LOCKWOOD—I cannot. I think the only way in which you can get any information about that is through those who control the exchanges in the different parts of the country. Some have infringers, and some have not; but I do not know any one who can inform you as to the whole number of infringements that have been started. Have no doubt that Philadelphia has borne the brunt of the matter.

MR. DURANT—The effort is not very heavy here. I only ask, because a statement was made in St. Louis that I cannot refute, and I would like to get the information if I can.

THE PRESIDENT—I think it is perfectly safe to say that there is not in operation anywhere an infringing exchange which is deriving a serious income from its business, or is affecting the income of any existing Bell Exchange Association seriously.

MR. DURANT—I made that statement some time ago; but it was disputed.

MR. FAY—I do not think there is any exchange anywhere except in Philadelphia, with the exception of New Orleans. I have heard that New Orleans is affected in that way.

THE PRESIDENT—There is a beautiful system in Utica, which has no instruments on the end of the line. That is

probably the most complete plant that has been built in opposition to the Bell.

MR. METZGER—What instruments do they propose to use?

THE PRESIDENT—I believe they intend to use the Baxter form of instruments. I am told in our territory in Connecticut that there are two or three hundred subscribers to competing exchanges. But we have not lost anybody yet, and there are no switch-boards or connections, or anything of that kind, as far as those are concerned, only subscribers. The Newark Company says something about using the Overland instruments, when they lose the Bell instruments, but that is a question to be settled in the future. Mr. Eastabrook has had some experience in Elmira, which may be interesting, in which he used what I should term the extinguishing process with a subscriber; perhaps he had better tell us about that.

MR. EASTABROOK—I do not know that this would crush the opposition, but I do know that up to the time of this stiffening of our backbone occurred, they managed to get people, and finally I determined that, in my judgment, we had better take the bull by the horns, and I so advised the Board of Directors. I told them we ought to try stringent measures, and they told me to go on and try them. So we raised the rates one dollar a month, and when subscribers came to me from all quarters and complained about the extra charge, I told them we did not want to raise money for construction, and we did not care a continental whether we got any more subscribers or not, but that the principal reason for our increasing the rate was, that if they would not wait until the United States Courts decided this patent question, but became subscribers to an opposition exchange to go ahead, but to listen for the click of the "Bell" when the day of judgment came, because we proposed to collect from them every dollar that they took away from us and gave to the opposition exchanges; and after that we heard no more of the opposition.

MR. FAY—I had a funny experience in Chicago. There,

on account of the prohibitory ordinance with electric lights, the opposition companies have been expecting to go underground, and they have canvassed, and claim to have seventeen hundred subscribers, and also a complete system to go underground. I do not know if it is Mr. Hotchkiss' system or not, but there are three companies which have been started there: the Pan Electric, the Shaw and the Overland. The Pan Electric got a couple of telephones and put them on a wire, and one day we happened to need that wire, which was our own, and we cut it, and found their telephones on it. We cut it away and put it where it would do the most good, and a few days after that I had an application from the district superintendent of the Western Union Telegraph Company to know whether we would restore the wire which had been cut; and when we came to find out about the matter, we ascertained that Mr. Durant had come on from St. Louis, and had tried to borrow a wire from the Western Union people, but had actually borrowed one of ours. The next case was with the Overland Company. They have a very good organization in Chicago, containing many names prominent in commercial circles, one of whom is a member of a large stove manufacturing works. He built a wire on the west side of the river, and wanted to connect with his store by a private line. He is a subscriber of ours, and came to us to make the connection. We gave him an estimate on it and did not hear anything more about it. After that, the Western Union foreman came to our man and wanted to know why we had stolen a certain Western Union wire which ran under the river. We said that we had not stolen it, and they should cut it, and find out who had. The foreman of the Western Union did so, and found out that it was the stove men who had stolen it, and so the wire remained cut, and the stove men were left out in the cold. The next day one of our wires on Lake street was open. This was Saturday, and on Sunday we took it down, and the line of poles along with it. The next day we cut that wire and found that it ran into this stove works, and after that cutting we told them if they wanted to hire a line

they had better rent it from us. They came and made application for a private wire, signed a contract in due form, and the matter was settled.

MR. EASTABROOK—That reminds me of a circumstance that I think puzzled me more than anything that ever came under my notice. The Molecular Company have a few lines in our country, and they were trying to operate them, and several friends of mine in whom I had every confidence, and whom I thought must certainly know what they were talking about, tried one of those lines that ran right among a lot of Western Union wires for half a mile, and assured me upon their word that the line worked just as well as any of our systems, and that there was an absolute absence of any induction from telephone lines or telegraph wires. That statement came to me from four or five persons, and, of course, that knocked theory, practice, science, and everything else in the head. I could not understand it. I knew where the wire was, and that it was a direct wire, and was not a metallic circuit. A few days after they sent an electrician to put up some instruments, and upon his report they were very suddenly kicked out. I asked the electrician what this thing meant, and asked him to explain this absence of induction, as I wanted to understand it. I said, "How do you account for it, anyhow? They say there is no induction there." Said he, "The transmitter will not transmit induction, and that is what the trouble is."

THE PRESIDENT—Would it transmit anything else?

MR. EASTABROOK—No, sir.

MR. SABIN—Can we get any information from Philadelphia in relation to this subject?

THE PRESIDENT—Is there anybody here who represents the Philadelphia Company, and who knows anything about this matter? The Chair hears no response. If not, a motion to adjourn will be in order.

MR. SABIN—I renew my motion that the Association adjourn.

THE PRESIDENT—It is moved and seconded that this meeting of the Association finally adjourn. Are you ready

for the question? As many as are in favor of adjournment will signify their assent by saying aye. The ayes have it. It is a vote. This meeting stands adjourned *sine die*. The next meeting of the Association will be held in Providence, R. I., on the second Tuesday of September, 1885.

APPENDIX A.

OFFICERS FOR THE YEAR 1884—1885.

President,

M. F. TYLER, - - - - - New Haven, Conn.

Vice-President,

W. H. ECKERT, - - - - - New York.

Secretary,

W. D. SARGENT, - - - Brooklyn, N. Y.

Treasurer,

H. L. STORKE, - - - - - New York.

Advisory Committee,

For three years—W. A. JACKSON, Detroit, Mich.
For two years—H. B. LYTLE, Boston, Mass.
For one year—G. C. MAYNARD, Washington, D. C.

Executive Committee,

MORRIS F. TYLER, *Ex-officio* - New Haven, Conn.
JAS. BIGLER, - - - - Newburgh, N. Y.
H. N. GIFFORD, - - - - Louisville, Ky.
HENRY METZGER, - - - - Pittsburgh, Pa.
W. N. EASTABROOK, - - - Elmira, N. Y.

Committee on Standard Wire Gauges.

T. B. DOOLITTLE, - - - - New York.
D. I. CARSON, - - - - - New York.
W. D. SARGENT, - - - - - Brooklyn.

APPENDIX B.

ROLL OF ACTIVE MEMBERS.

American District Telegraph Co., Syracuse, N. Y.
Beach & Hunt, West Winsted, Conn.
Bell Telephone Co. of Buffalo, Buffalo, N. Y.
Bell Telephone Co. of Missouri, St. Louis, Mo.
Bell Telephone Co. of Philadelphia, Philadelphia, Pa.
Central District & Printing Telegraph Co., Pittsburgh, Pa.
Central Pennsylvania Telephone & Supply Company, Williamsport, Pa.
Chicago Telephone Co., Chicago, Ills.
City & Suburban Telegraph Association, Cincinnati, O.
Colorado Telephone Co., Denver, Col.
Commercial Telephone Co., Albany, N. Y.
Central Union Telephone Co., Chicago, Ills.
Cumberland Telephone & Telegraph Co., Nashville, Tenn.
Chesapeake & Potomac Telephone Co., Washington, D. C.
Central New York Telephone & Telegraph Co., Utica, N. Y.
Danbury Telephone Despatch Co., Danbury, Conn.
Delaware and Atlantic Telephone & Telegraph Co., Philadelphia, Pa.
East Tennessee Telephone Co., New York City.
Empire State Telephone & Telegraph Co., Auburn, N. Y.
Erie Telephone & Telegraph Co., Boston, Mass.
Great Southern Telephone & Telegraph Co., Nashville, Tenn.
Hudson River Telephone Co , New York City.
Iowa Union Telephone & Telegraph Co., Davenport, Iowa.
Metropolitan Telephone & Telegraph Co., New York City.
Missouri & Kansas Telephone Co., Kansas City.
McDaniel, C. W., Carthage, Mo.

Michigan Telephone Co., Detroit Mich.
Nebraska Telephone Co., Omaha, Neb.
New York & New Jersey Telephone Co., Brooklyn N. Y.
New York & Pennsylvania Telephone Co., New York.
New England Telephone & Telegraph Co., Boston, Mass.
Ohio Valley Telephone Co., Louisville, Ky.
Pacific Bell Telephone Co., San Francisco, Cal.
Providence Telephone Co., Providence, R. I.
Pennsylvania Telephone Co., Harrisburg, Pa.
Southern Bell Telephone & Telegraph Co., New York City.
Southern Massachusetts Telephone Co., New Bedford, Mass.
Southern New England Telephone Co., New Haven, Conn.
Sunset Telephone & Telegraph Co., San Francisco, Cal.
United Telephone Co., Kansas City, Mo.
Wisconsin Telephone Co., Milwaukee, Wis.

HONORARY MEMBERS.

American Bell Telephone Co., Boston, Mass.
Bell, A. Graham, Boston, Mass.
Bell Telephone Co., Montreal, Can.
Bridgeport Brass Co., Bridgeport, Conn.
Beetle, George L., Chicago, Ills.
Bailey, C. E., Havana, Cuba.
Berthon, A., Paris, France.
Childs, W. A., New York.
Cheever, Charles A., New York.
Cassidy, John, Honolulu.
Clark Ins. Elec. Wire Co., Philadelphia, Pa.
Dana, R. H., New York.
Day, A. G., New York.
Electrical Supply Co., New York.
Lockwood, Thomas D., Boston, Mass.
Maynard, George C., Washington.
Madden, O. E., Boston, Mass.
McConnell, J. T., Pittsburgh, Pa.
Phillips, George L., Dayton, O.
Phillips, E. F., Providence, R. I.
Potter, F. I., Pittsfield, Mass.

Pope, H. W., New York.
Palmer Wire Co., Palmer, Mass.
Roebling's Sons, J. A., New York.
Sawyer, W. H., Providence.
See, I. W., Cincinnati, O.
Standard Electrical Works, Cincinnati, O.
Utica Fire Alarm Telegraph Co., Utica, N. Y.
Williams, Jr., Charles, Boston, Mass.
Western Electric Co., Chicago, Ills.

APPENDIX C.

CONSTITUTION.

ARTICLE I.—NAME.

The name of this Association shall be "THE NATIONAL TELEPHONE EXCHANGE ASSOCIATION."

ARTICLE II. OBJECT.

This Association is formed for the purpose of collecting, preserving and protecting all matters of importance to telephone interests.

ARTICLE III.—MEMBERSHIP.

1. The members of this Association shall be such companies or individuals as hold exchange licenses or authority from the American Bell Telephone Company ; and in the meetings of the Association each member shall be entitled to one vote for each exchange operated by such company or individual, but there shall be but one exchange within the corporate limits of any city or town entitled to a vote.

2. Such companies or individual licensees attending the first meeting for the organization of the Association are hereby declared to be members thereof, provided they shall pay the admission fee and subscribe to this constitution, or otherwise in writing notify the Secretary of their acceptance of membership on or before January 1, 1881.

ARTICLE IV.—OFFICERS.

1. The officers of this Association shall be a President, Vice-President, Secretary, Treasurer, and an Executive and an Advisory Committee ; who shall, with the exception of the members of the Advisory Committee, be elected at each annual meeting of this Association, and shall hold office for one year, or until their successors are duly elected and qualified.

ARTICLE V.—PRESIDENT.

The President shall preside at all meetings of the Association, and is *ex-officio* Chairman of the Executive Committee.

ARTICLE VI.—VICE-PRESIDENT.

The Vice-President shall, in the absence or inability of the President, act as President of the Association.

ARTICLE VII.—SECRETARY.

The Secretary shall keep a record of the proceedings of all meetings of the Association, conduct the correspondence, with the concurrence of the President, and discharge such other duties as shall be required of him by the Association.

ARTICLE VIII.—TREASURER.

The Treasurer shall collect and disburse the moneys of the Association, and shall give security in such sum and in such form for the faithful performance of the duties of Treasurer as shall be required by the Executive Committee.

ARTICLE IX.—EXECUTIVE COMMITTEE.

1. The Executive Committee shall consist of five members, three of whom shall constitute a quorum for the transaction of any business.

2. This Committee shall be vested with the power of trustees as far as the affairs of this Association are entrusted to their charge by provisions of the Constitution and By-Laws, and no further.

3. It shall submit to the Association a written report of its doings at each meeting of this Association.

4. It shall receive from the Secretary and transmit to the Association, all applications for membership, together with its report thereon, in writing, and said Committee may admit or reject during the intervals of meeting any application so received, subject, however, to approval or disapproval of this Association at its next meeting, and the action of this Committee shall not be final, but advisory only, in reference to such application.

5. The only salaried officer of this Association shall be the Secretary, whose compensation shall be fixed by the Executive Committee from time to time.

ARTICLE X.—ADVISORY COMMITTEE.

1. An Advisory Committee of three shall be elected at the first meeting of the Association, one for three years, one for two years, and one for one year; and one member shall thereafter be elected at each annual meeting for the term of three years.

2. It shall be the duty of this Committee to consider and report to the Association such amendments to the Constitution and By-Laws, as in their opinion will best further the aims and purposes of the Association.

3. The Committee may also hear, at their discretion, any specific complaint which may be made to them by any member of the Association in writing, affecting telephone interests, and shall report thereon to the Association with such recommendations as it may deem advisable.

4. It may also consider any question touching the interests of the members of this Association that may be referred to it, and may call for papers or other

documentary evidence in their possession which the majority of said Committee may deem necessary for the information of such Committee in making such examination and compiling a report thereon. A refusal by any member of this Association to furnish such papers and information as may be called for, shall cause his immediate suspension until restored by a majority vote of the members of the Association present. Members of this Association suspended by the Advisory Committee shall be entitled to all the rights and privileges of members on any question affecting their membership until the final adjudication of the question by the Association.

5. The Treasurer shall honor, so far as the funds in his hands will permit, drafts made upon him by the Secretary and countersigned by the Chairman of the Advisory Committee, in payment of expenses of such Committee in obtaining information desired and incident to the proper performance of the duties of such Committee.

ARTICLE XI.—Other Committees.

The Association may provide in its By-Laws for other Committees, but no matter shall be referred to a Special Committee which is relevant to the functions of any Standing Committee.

ARTICLE XII.—Liabilities.

No officer, or Committee, or other person, shall have any power to make the Association liable for any debt amounting to more than one-half of the money in the Treasurer's hands, beyond that required to meet prior liabilities.

ARTICLE XIII.—Meetings.

1. There shall be an annual meeting of the Association held on the first Tuesday after the first Monday of September in each year, at such place as may be determined by the Association, or upon its failure to designate a place for such meeting, the Executive Committee may make such selection at least sixty days previous to the time of holding said annual meeting.

2. Special meetings of this Association may be called by the President, or Advisory Committee of its own motion, and shall be called by the Secretary upon the request of twenty members of the Association, in writing, signifying the purposes thereof, and the Secretary shall give notice of such special meeting to each member of the Association, by mailing a written or printed notice thereof, at least thirty days prior to said meeting, to the last known post-office address of such members.

ARTICLE XIV.—Fees.

1. The admission fee shall in all cases be ten dollars, to be paid on signing the Constitution. The annual dues shall be ten dollars for each vote now had or that may be hereafter acquired under the Constitution, and shall be payable yearly on or before the first day of July in each year.

2. The Association may, by resolution and majority vote of the members present, make an assessment for any purpose in addition to above provisions.

ARTICLE XV.—EXPULSION.

Any member may be suspended or expelled for misconduct, or other sufficient cause after conviction thereof, by a two-thirds vote of the members of the Association present at any regular meeting.

ARTICLE XVI.—AMENDMENTS.

This Constitution shall go into effect immediately. It shall be amended only by a two-thirds vote of the members present at a meeting of the Association, after the notice of the proposed amendments.

ARTICLE XVII.—HONORARY MEMBERSHIP.

1. Any person actively interested in the objects of this Association may become an honorary member of the Association by the vote of a majority of all the members represented at such meeting, and the payment of an entrance fee of twenty-five dollars.

2. An honorary member shall have no vote in the meetings of the Association, and shall be subject to no dues or assessments.

APPENDIX D.

AMENDMENTS.

CONSTITUTION.

Adopted at the Chicago Meeting, April, 1881.

I.

ART. XVI. SEC. 2. The Association may, by resolution adopted by a majority of all the votes of the Association, make assessments on the members thereof, and such assessments shall be uniform and equal, and on the basis of the number of votes to which each member may be entitled at the time such assessments are made, and representatives may vote either in person or by proxy.

II.

ART. XVI. SEC. 1. This Constitution shall go into effect immediately.

SEC. 2. It can be amended only by a two-thirds majority of the votes cast therefor at a meeting of the Association held after notice of the proposed change.

SEC. 3. Notice of such proposed change shall be given by filing with the Secretary, at least sixty days before the meeting at which such proposed change is to be acted on, a copy of the section as it will read when modified as proposed, and the Secretary shall immediately thereafter transmit a copy of such notice to the post-office address of each member.

Adopted at the Boston Meeting, September, 1882.

III.

ART. XIII. SEC. 1. There shall be an annual meeting of the Association held on the third Tuesday in October in each year, at such place as may be determined by the Association, or upon its failure to designate a place for such meeting, the Executive Committee may make such selection at least sixty days previous to the time of the holding of said annual meeting.

At the Cincinnati Meeting, October, 1883.

Amendment III. was formally nullified, having been irregularly passed.

Adopted at the Philadelphia Meeting, September 16, 1884.

IV.

ART. XIII. "That the Association at its annual meetings, by a two-third vote of the members present, shall designate the time and place of the next annual meeting.

APPENDIX E.

BY-LAWS.

ARTICLE I.

The officers of this Association shall be put in nomination by the Association, and elected by ballot at each annual meeting of the Association.

ARTICLE II.—PRESIDENT.

The President shall, in addition to his duties as prescribed by the Constitution, sign all warrants or orders drawn by the Secretary on the Treasurer.

ARTICLE III.—SECRETARY.

§ 1. The Secretary shall keep an accurate roll of officers and members, and notify officers and members of committees of their election or appointment.

§ 2. Shall issue notices of all meetings of the Association, with a brief note in case of special meetings of the object for which they are called; and shall keep correctly the accounts of the Association, and at each annual meeting submit a written report of the doings of his office to the Association.

§ 3. Shall draw and sign all drafts or orders on the Treasurer, transmitting a brief memorandum of the nature of the expenditure to the Treasurer at the date of such draft.

§ 4. Shall transmit to the Chairman of the Executive Committee all applications for membership upon their receipt by him, make a proper entry of their receipt and disposal upon the records of the Association, and upon the unanimous report of said committee, upon such application being filed in his office, shall at once transmit a conditional certificate of membership to such applicant, which shall entitle said applicant to all the privileges of membership until the next meeting of this Association.

ARTICLE IV.—TREASURER.

§ 1. The Treasurer shall keep an accurate roll of the members, and shall collect, under the direction of the Executive Committee and other specially empowered committees, expend, deposit or invest the funds of the Association.

§ 2. Shall keep regular books of accounts, which shall be open to inspection by any member of the Executive Committee.

§ 3. Shall report in writing to each regular meeting of the Association, and to the Executive Committee, as and when requested by them, the financial condition of the Association.

§ 4. His report at each annual meeting of the Association shall contain a statement of the receipts and disbursements for the year, and of the outstanding obligations, and an estimate of the resources and expenditures for the ensuing year, and his accounts shall be at all times subject to examination and approval by the Executive Committee.

ARTICLE V.—COMMITTEES.

§ 1. The Executive Committee may hold its meetings whenever a majority of its members, or the President of this Association, shall deem it for the interests of this Association to do so, upon ten days' notice by mail being given to each member of the time and place of holding such meeting, such notice being signed by either a majority of the members of said committee, or by the President of the Association. The Committee shall keep a systematic record of all its proceedings, and shall meet on the day preceding each annual meeting of the Association. It shall, upon the receipt of a proposition from the Secretary, transmit a copy of such proposition to each member of said committee, who will, in case it is not deemed expedient to hold a meeting of said committee, indorse his approval or disapproval upon said copy and return the same to the Chairman, who shall at once file the same, as a part of his report with the Secretary.

§ 2. The Advisory Committee shall choose from their number a Chairman, and shall keep a record of all its proceedings, and upon receipt of a complaint in writing properly stated, proceed to thoroughly examine the same and report its action. The provisions with reference to the meetings of the Executive Committee shall apply to the meetings of this Committee.

ARTICLE VI.—MEMBERSHIP.

Whenever hereafter any company or individual desires to become a member of this Association, it shall by resolution, at a regular meeting of the Board of its Directors, make application for membership, and shall forward a copy of such proceedings, properly attested by the corporate officers and seal of said corporation, together with the admission fee, to the Secretary of this Association, when such proceedings shall be had as are heretofore indicated in Articles II. and V., subject, however, to such action as this Association may at its next regular meeting take in either accepting or rejecting said proposition, when, if the application is rejected, the applicant will be notified by the Secretary.

ARTICLE VII.—NON-PAYMENT OF DUES.

If any member fails to pay the yearly dues or assessments within one month from the first day of July, when the same become payable, it will be the duty of the Treasurer to mail such member a copy of this By-Law and notice, that unless the same are paid within one month thereafter, the default will be reported to the Executive Committee, which may by order, without further notice, cause the name of such member to be stricken from the rolls, and such membership and all rights in respect thereof will thereupon cease. But upon written application, satisfactorily explaining the default, and upon payment of all dues

to the date thereof, the Executive Committee shall have power to remit the penalty of this By-Law and restore the membership.

ARTICLE VIII.—AMENDMENTS.

These By-Laws may be amended at any regular or called meeting by a vote of the majority of all the votes represented at such meeting, provided that thirty days' previous notice in writing shall have been given to the Advisory Committee, and also to the Chairman of the Committee (if any) affected thereby.

ARTICLE IX.—SUSPENSION OF RULES.

These rules may be suspended at any meeting of the Association by a majority of all the votes represented at such meeting.

Amendment to By-Laws adopted at Philadelphia, Sept. 16, 1884.

ART. X. "At each annual meeting there shall be appointed by the President a General Committee on Statistical Information for the ensuing year, of which the Secretary shall be *ex-officio* chairman. The number of members of this Committee shall be determined from year to year by the President, according to the amount of assistance required by the Secretary, and it shall be their duty to render the Secretary such aid in the preparation and classification of information for presentation to the Association as he may require."

APPENDIX F.

REPORT OF CALLS MADE ON EACH SECTION OF SWITCH, AND ATTENDED BY ONE OPERATOR. TUESDAY, DECEMBER 9, 1884, SUBSCRIBERS 1,087.

HOURS.	A		B		C		D		E		F		G		H		I		K		L		Totals.		
	Calls from 111 Subs	Calls from Trunks.	Calls from 96 Subs.	Calls from Trunks.	Calls from 100 Subs.	Calls from Trunks.	Calls from 94 Subs.	Calls from Trunks.	Calls from 101 Subs.	Calls from Trunks.	Calls from 100 Subs	Calls from Trunks.	Calls from 98 Subs.	Calls from Trunks.	Calls from 93 Subs.	Calls from Trunks.	Calls from 94 Subs.	Calls from Trunks.	Calls from 105 Subs.	Calls from Trunks.	Calls from 95 Subs.	Calls from Trunks.	Calls from 1087 Subs.	Calls from Trunks.	Totals.
12 to 6 A. M	1	....	1	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	2	4
6 to 7 A. M	....	....	1	....	1	....	1	....	1	1	....	....	1	....	....	....	1	....	....	....	....	....	6	1	7
7 to 8 A. M	14	1	4	7	2	1	5	4	9	1	6	....	10	1	2	....	6	1	3	3	9	3	70	22	92
8 to 9 A. M	26	4	9	8	12	5	27	4	28	5	16	7	20	5	11	2	22	4	23	3	29	7	223	54	277
9 to 10 A. M	58	3	29	8	29	11	42	8	38	3	33	....	32	9	17	3	20	3	27	6	22	5	347	59	406
10 to 11 A. M	29	10	19	8	30	7	42	9	29	1	34	2	29	6	32	....	30	3	37	3	22	6	333	55	388
11 to 12 M	42	5	26	6	28	9	21	9	28	3	23	....	26	9	25	1	25	4	27	5	22	8	293	59	352
12 to 1 P. M	31	5	26	6	10	7	30	7	12	1	22	....	20	3	22	1	23	2	20	3	10	4	226	39	265
1 to 2 P. M	34	7	28	4	22	6	37	6	34	2	28	3	18	6	15	....	26	2	18	7	8	7	268	50	318
2 to 3 P. M	38	4	28	14	23	6	30	5	25	4	31	....	32	6	26	....	20	1	30	3	17	6	300	49	349
3 to 4 P. M	30	3	26	6	32	2	17	6	26	2	25	2	18	6	26	1	17	2	17	1	28	4	262	35	297
4 to 5 P. M	36	7	25	3	26	6	21	8	18	4	36	1	25	2	12	....	19	1	25	5	16	5	259	42	301
5 to 6 P. M	26	1	20	6	28	2	19	3	20	3	10	1	14	1	14	1	11	1	12	....	14	3	188	22	210
6 to 8 P. M	13	3	23	2	17	5	10	....	18	1	23	1	18	1	9	....	19	1	20	6	12	2	182	22	204
8 to 10 P. M	9	....	8	....	7	5	5	....	8	....	6	....	7	....	6	....	7	..	10	3	9	....	82	8	90
10 to 12 P. M	1	....	4	....	4	1	3	1	2	....	3	....	....	1	3	....	2	....	3	1	5	....	30	4	34
Totals	388	53	277	78	271	75	310	70	296	31	296	17	270	56	220	9	248	25	272	49	223	60	3071	523	3594

NOTE.—This table is offered as a form for large offices to get at the distribution of work and business.—*Secretary.*

APPENDIX G.

REPORT OF CONNECTIONS MADE AT BROOKLYN CENTRAL OFFICE, TUESDAY, DECEMBER 9TH, 1884. No. OF SUBSCRIBERS, 1,087; No. OF OPERATORS, 17 DAY, 2 NIGHT.

HOURS.	Local Connections.	New York City Connections.		Local Trunk Connections.						Long Island, New Jersey and New York State Connections.																		Total.
				Wm'b'g.		G'p't.				East New York.		Babylon		Jersey City.		Paterson.		Newark		Hoboken.		Orange.		Harlem.						
		Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	Sent.	Rec'd.	
12 to 6 A. M.	2	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4
6 to 7 "	5	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	7
7 to 8 "	55	3	2	10	19	2	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	94
8 to 9 "	167	23	23	30	46	3	5	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	300
9 to 10 "	233	60	46	50	52	3	5	....	....	....	2	....	....	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	453
10 to 11 "	214	63	57	47	48	7	6	....	....	1	1	....	....	1	....	....	....	....	1	....	....	....	....	....	2	....	....	....	....	448
11 to 12 M.	190	61	48	39	53	2	4	....	....	....	2	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	400
12 to 1 P. M.	145	50	42	25	36	5	3	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	307
1 to 2 "	183	41	43	38	48	4	1	....	....	....	1	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	361
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8 to 10 "	74	1	2	7	8	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	92
10 to 12 "	26	2	5	2	3	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	40
Totals	3,147	462	426	411	468	40	43	....	....	1	12	1	....	8	2	....	2	....	1	....	1	1	1	....	4	....	....	....	....	4,031

NOTE.—This table is offered as a form for large offices to get at the distribution of work and business.—*Secretary.*

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